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RESEARCH AND DEVELOPMENT TECHNICAL REPORT
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METEOROLOGICAL INFLUENCE OF A SOLAR ECLIPSE ON THE STRATOSPHERE

By

J. S. Randhawa

B. H. Williams

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December 1970

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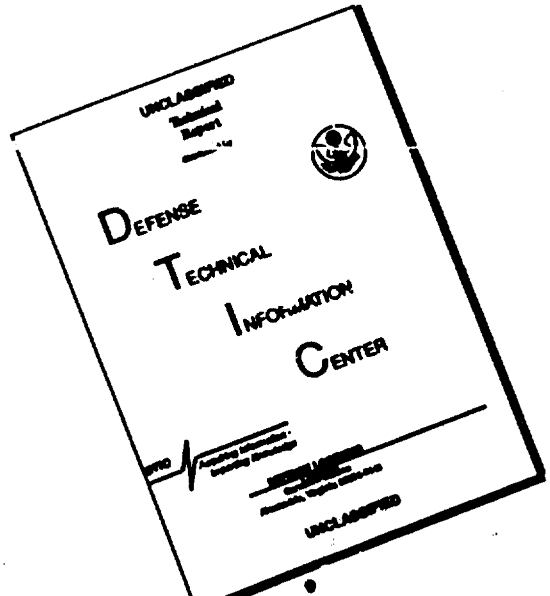

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METEOROLOGICAL INFLUENCE OF A SOLAR ECLIPSE ON THE STRATOSPHERE

By

J. S. Randhawa

B. H. Williams

M. D. Kays

Atmospheric Sciences Laboratory
White Sands Missile Range, New Mexico

December 1970

DA Task No. 1T061102B53A-18

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U. S. Army Electronics Command

Fort Monmouth, New Jersey

ABSTRACT

An experiment to study the influence of a solar eclipse on the earth's lower atmosphere was conducted at Eglin Air Force Base, Florida, where a solar eclipse occurred on 7 March 1970. Three temperature-ozonesondes and eight Arcasondes were deployed into the upper stratosphere and lower mesosphere at times prior to, during, and after the total eclipse. In addition, two electrochemical ozonesondes were flown on balloons on 5 and 6 March. Resulting temperature, wind and ozone data are presented. No measurements were made during the totality. An increase in ozone was measured during and several hours after the partial eclipse. Higher temperatures and a perturbation in the zonal wind field were observed in the middle stratosphere during the partial eclipse.

CONTENTS

INTRODUCTION

During the last two decades, a significant amount of research has gone into intriguing problems involving the structure and dynamics of the stratosphere and mesosphere. Ozone is an important constituent of that region and, because of its strong absorption of solar ultraviolet radiation, plays a special role in the radiative thermal budget. It thus helps to develop some of the characteristics of the general circulation of the upper stratosphere and mesosphere.

When solar radiation is denied to the earth's atmosphere during an eclipse of the sun, marked changes occur in its state, particularly in the ionosphere where the effects can be studied by means of radio waves. At lower elevations, the denial of solar radiation also affects the ozonosphere where it is found to produce increased ozone concentration due to the absence of photochemical reactions. Measurements of total ozone content in a vertical column during partial eclipses have been reported by Stranz [1] and Bojkov [2] who show an increase in the total amount shortly after the maximum phase of the eclipse. Ozone observations were made using a rocket-borne ozonesonde by Randhawa [3] during a total eclipse on 12 November 1966. An increase in the ozone concentration was noted as the sonde passed through the total eclipse shadow between 60 and 54 km altitude.

The stratospheric circulation in Northern Hemisphere lower midlatitudes has been shown to exhibit a strong diurnal response to solar heating in the 45-55 km altitude region [4, 5]. This diurnal tidal motion is characterized by wind variations of the order of 20 mps in a layer centered near the stratopause level. Rocket sounding data indicate a well-developed meridional variation, with the circulation directed away from the equator during the morning hours and toward the equator during the afternoon and evening. The zonal diurnal variation in March is less definite but generally indicates a weakening flow during the day and strengthening (more westerly) at night.

The introduction of an eclipse shadow into the stratospheric solar heat input provides an opportunity for inspection of a new mode of stratospheric response to a change in solar heat input. The progress of the eclipse shadow is significantly different from sunset-sunrise perturbations and provides unique conditions in which to study the response times of the region.

An experiment to study these effects was performed at Eglin Air Force Base (29°41'N, 85°20'W) during the total solar eclipse which occurred on 7 March 1970. Meteorological sensors to measure temperature, ozone and wind before, during and after the total eclipse were deployed near 60 km altitude by Arcas rockets.

EXPERIMENT

The path of totality moved northeastward over the Gulf of Mexico, across the Florida Panhandle and along the east coast of the United States. The duration of complete darkness at the center line was 190 seconds, starting at 1313 EST. The launch site, indicated as D-3 in Figure 1, was located about 10 km northwest of the path of totality. The sensors were rocket-launched into the totality at an azimuth of 129 degrees. Arcas meteorological rockets were utilized to carry the sensors, parachutes and transmitters to an altitude of 55-60 km. After ejection, the sensors descended on radar-reflective parachutes (4.5m diameter). The transmitted signals were pulse modulated and received by a GMD receiver on a carrier frequency of 1680 MHz. FPS-16 radars were used for tracking the parachutes and provided the altitude of the instrument with time. The three types of sensors used during this experiment were:

A. STS-Ozonesonde: This is a dual-channel rocket-borne ozonesonde [6] which incorporated a temperature-sensing bead thermistor on a time-sharing basis with an ozone sensor. Ozone is detected by the chemiluminescent principle and the sensor consists of Rhodamine B adsorbed on silica gel. Each instrument was calibrated before launch by use of an ozone generator [7] for the absolute measurement of ozone concentration in the atmosphere. Ozonized air of known concentration was injected into the sampling bottle at a known flow rate, and instrument sensitivity was set in the proper range. Figure 2 shows this dual sensor.

B. Temperaturesonde: This is a single-channel temperature instrument [8] which also has a bead thermistor as its sensing element.

C. Electrochemical Ozonesonde: During the course of this experiment two electrochemical ozonesondes (Mast type) [9] were attached with AMT-12 Radiosondes and flown on balloons, one on 5 March and the other on 6 March 1970. The objective of these balloon flights was to study the low-level ozone distribution and to compare the data derived from the two systems at overlap levels.

Surface weather conditions for several days prior to the eclipse were in general humid with occasional rain. The day of the eclipse, 7 March 1970, was quite cloudy with intermittent rain during the morning hours and heavy rain during eclipse time. A low-pressure system was moving northeastward from the Gulf of Mexico across western Florida.

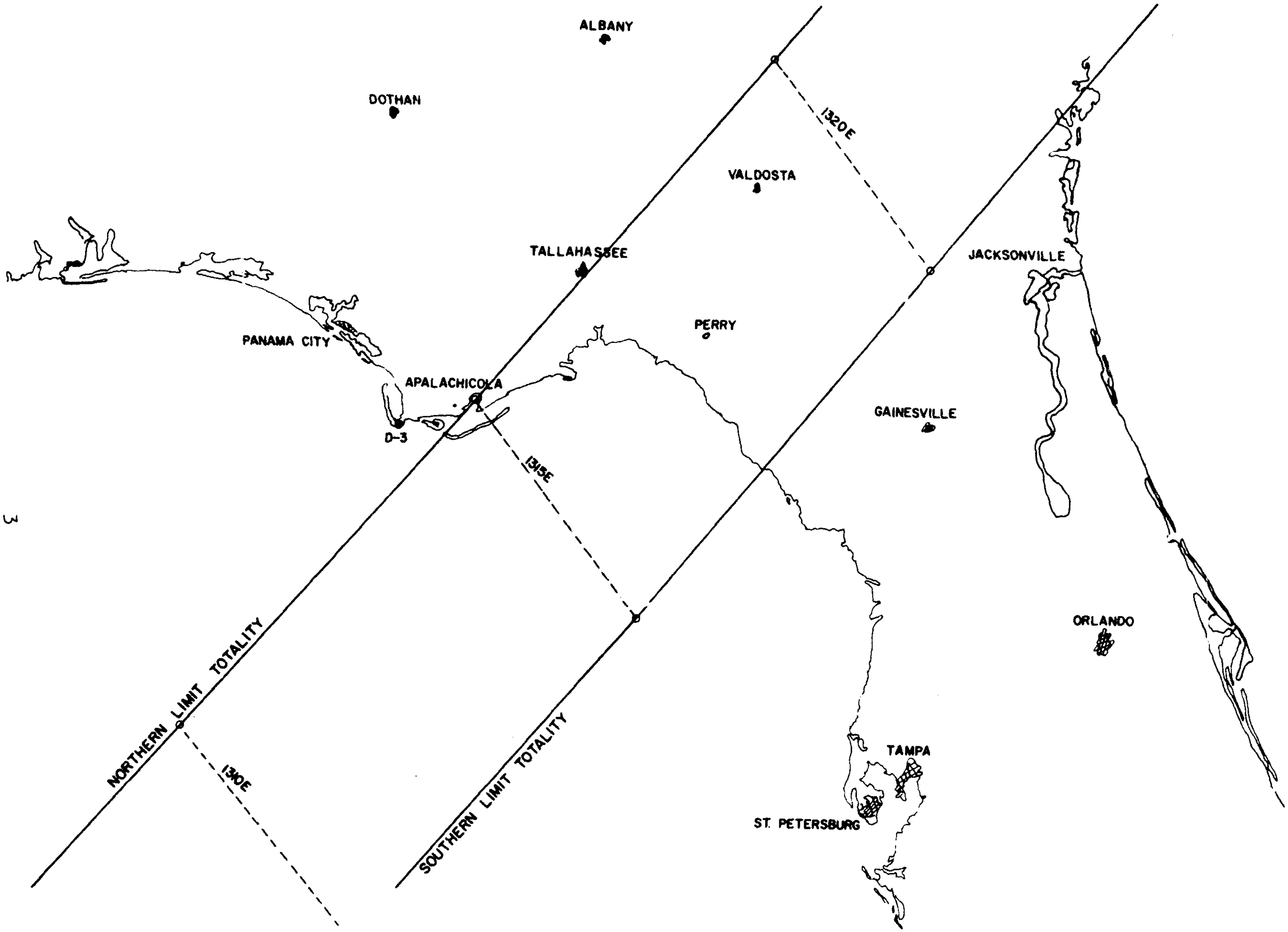
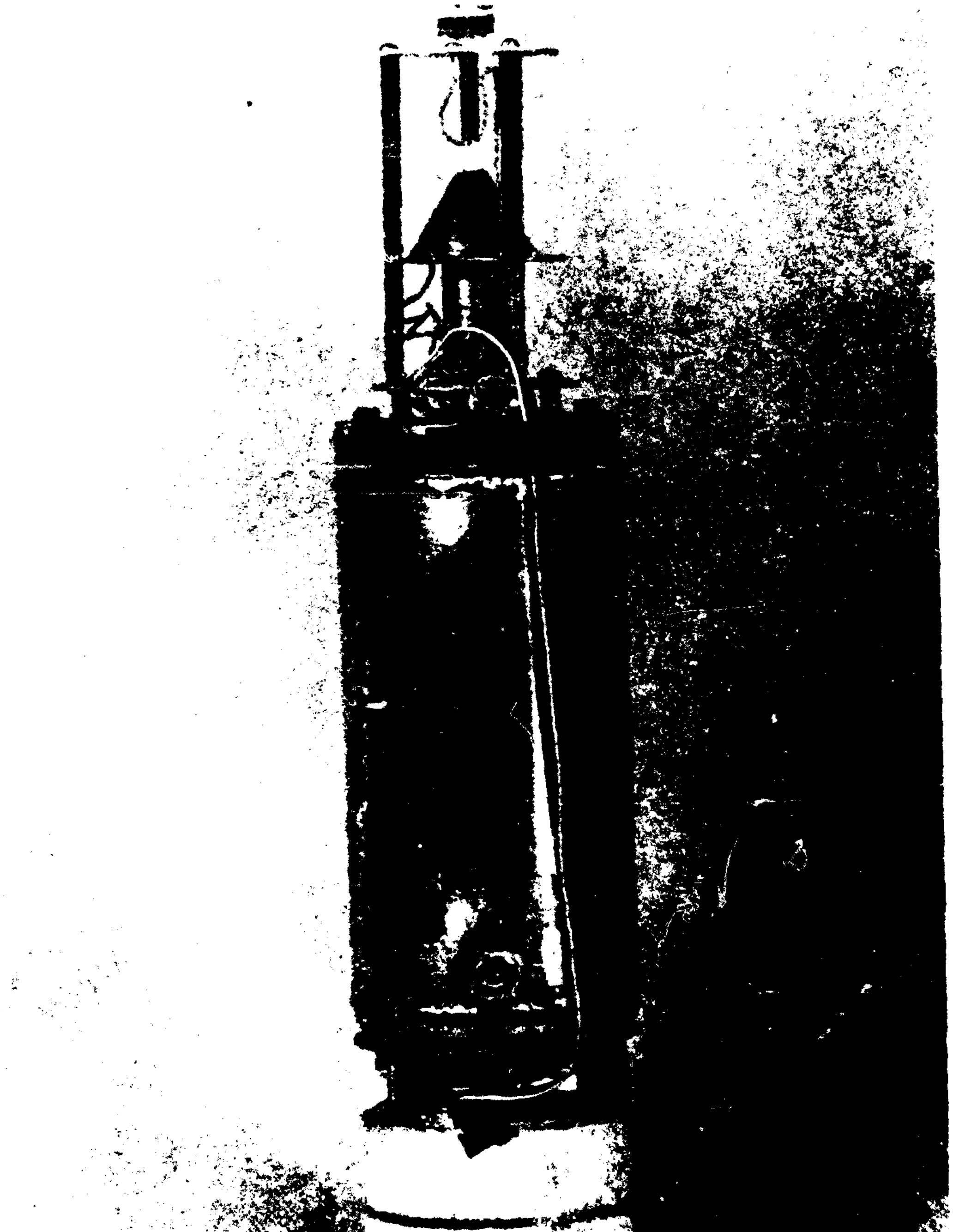


Figure 1. Path of Eclipse Shadow.



STS-OZONESONDE

RESULTS AND DISCUSSION

Eleven rockets were launched at the times given in Table I. Three soundings produced temperature, ozone, and wind data, six produced temperature and wind data, and two produced wind data only. All these data are presented in Appendix A in tabular and graphical form. Total ozone measured with a Dobson spectrophotometer at Tallahassee, Florida (30°23'N, 84°22'W) is given in Table II. Skies during daylight hours at Tallahassee on 5 and 6 March were partly cloudy and on 7 March were overcast with high clouds. No precipitation was recorded during this period.

Ozone

Two Mast electrochemical ozonesondes were flown, one on 5 March and the other on 6 March; the data received are presented in Figures 3 and 4. There are no marked differences in the two distributions except for a small increase near 18 km and a slight decrease at 10 km altitude on 6 March. Total ozone measured at Tallahassee on the same days also showed no large variation.

On the day of the eclipse, three ozone soundings (Figure 5) were made: one at 1404 EST (partial eclipse), the second at 1815 EST (one hour before sunset), and the third at 2015 EST (one hour after sunset). The eclipse sounding showed a higher than expected ozone concentration above 35 km. This higher concentration was also measured by the 1815 EST sounding which was made nearly four hours after the last contact. The night sounding (2015 EST) showed normal ozone distribution with two peaks, one near 25 km and the other near 19 km altitude.

As the photodissociation of ozone is gradually cut off during the eclipse, an increasing amount of ozone is formed through the three-body reaction

$$O + O_2 + M \longrightarrow O_3 + M$$

where M is the other oxygen molecule or is a nitrogen molecule. On the other hand, ozone can be destroyed by the following reaction as the solar radiation becomes available:

$$O_3 + h\nu \longrightarrow O_2 + O \ (\lambda < 11000\text{A}).$$

According to theory, maximum enhancement occurs after totality; thereafter a rapid decrease occurs as compared to build-up time [10]. As evidenced from these observations, ozone concentration did not decrease for a long time, even after the fourth contact. The increase measured during partial eclipse at some levels is more than 100 percent as

TABLE 1

Date	Launch Time (EST)	Measured Parameter
6 Mar 70	1339	Wind
6 Mar 70	1610	Temperature-Wind
7 Mar 70	1121	Wind
7 Mar 70	1310.5	Temperature-Wind
7 Mar 70	1311.5	Temperature-Wind
7 Mar 70	1404	Temp-Ozone-Wind
7 Mar 70	1600	Temperature-Wind
7 Mar 70	1815	Temp-Ozone-Wind
7 Mar 70	1820	Temperature-Wind
7 Mar 70	2015	Temp-Ozone-Wind
7 Mar 70	2020	Temperature-Wind

TABLE II

TOTAL OZONE MEASURED WITH A DOBSON SPECTROPHOTOMETER AT

TALLAHASSEE, FLORIDA (30°23'N, 84°22'W)

Date	Time (EST)	Total (m-atm-cm)
5 Mar 70	10-50'-30"	320
5 Mar 70	10-51-30	326
5 Mar 70	11-58-45	324
5 Mar 70	12-01-45	320
5 Mar 70	15-21-00	342
5 Mar 70	15-23-30	342
6 Mar 70	10-00-00	341
6 Mar 70	10-01-00	340
6 Mar 70	12-16-30	343
6 Mar 70	12-18-45	343
6 Mar 70	15-30-00	336
6 Mar 70	15-32-30	336
7 Mar 70	10-19-00	375
7 Mar 70	10-20-00	375
7 Mar 70	12-00-30	375
7 Mar 70	12-03-00	375
7 Mar 70	14-33-00	414
7 Mar 70	14-39-00	414
9 Mar 70	12-16-15	372
10 Mar 70	12-01-00	350

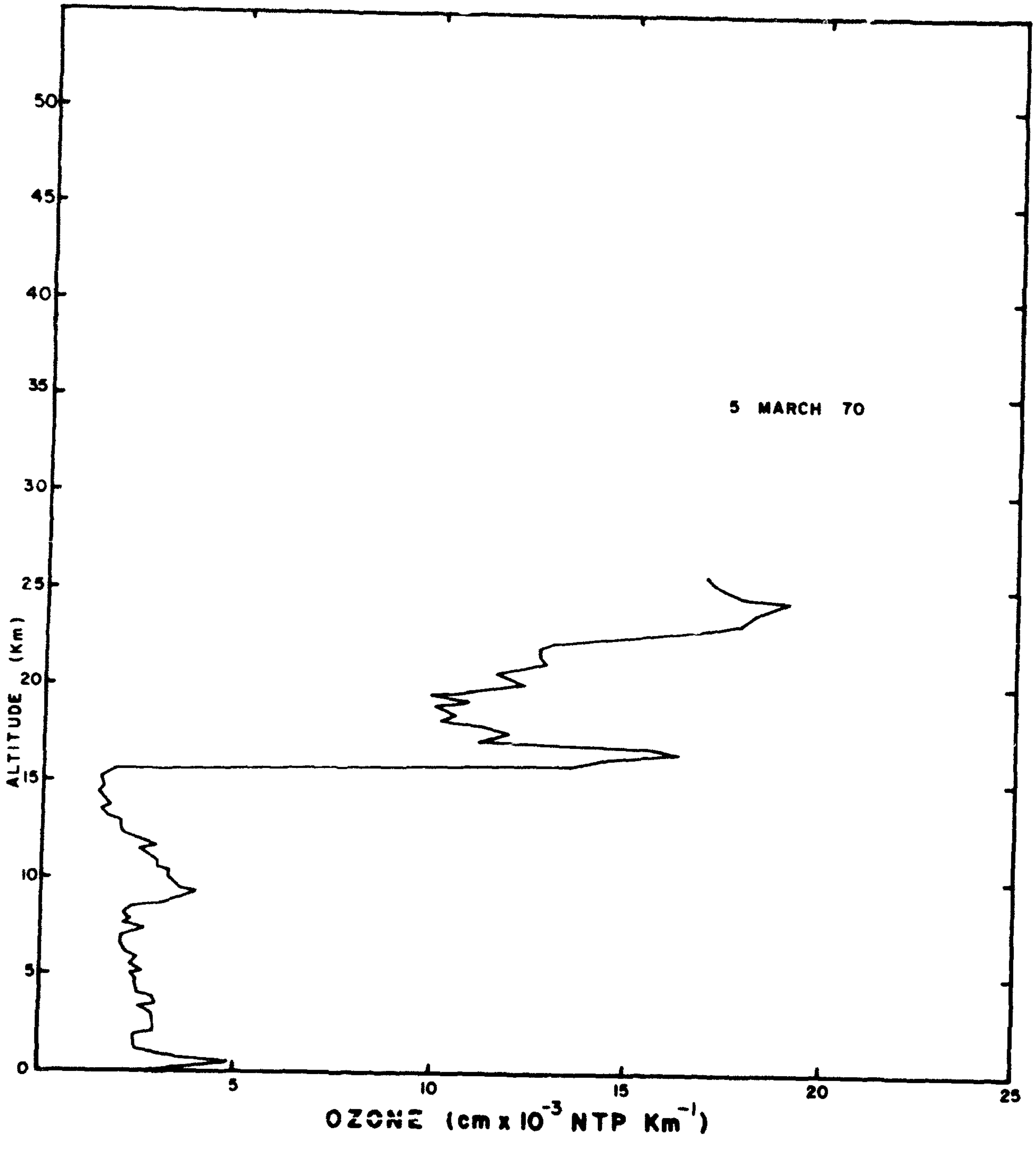


Figure 3. Ozone Concentration Obtained from the Mast Electrochemical Ozonesonde Flown on 5 March 1970, 1600 EST.

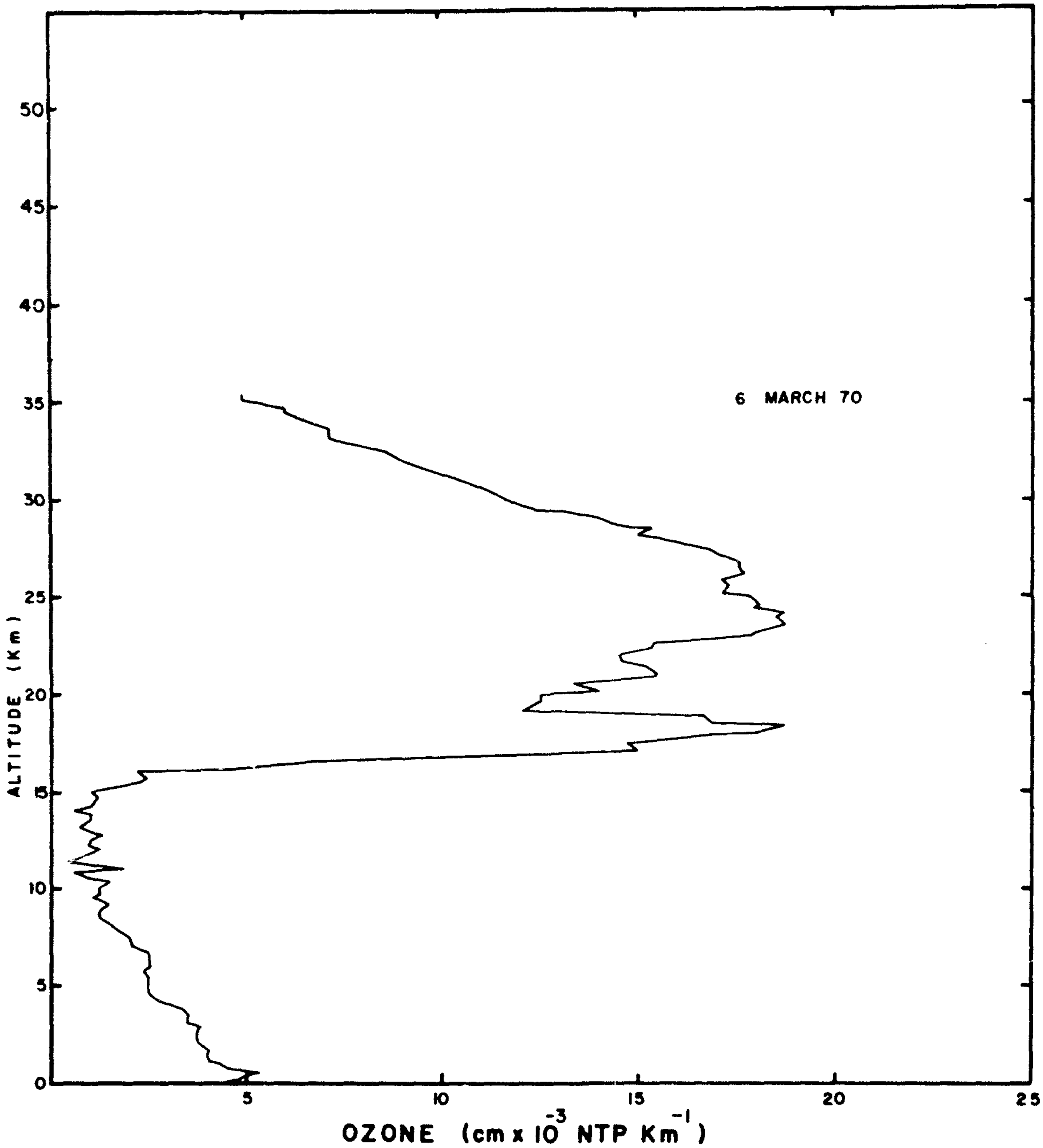


Figure 4. Ozone Concentration Obtained from the Mast Electrochemical Ozonesonde Flown on 6 March 1970, 1800 EST.

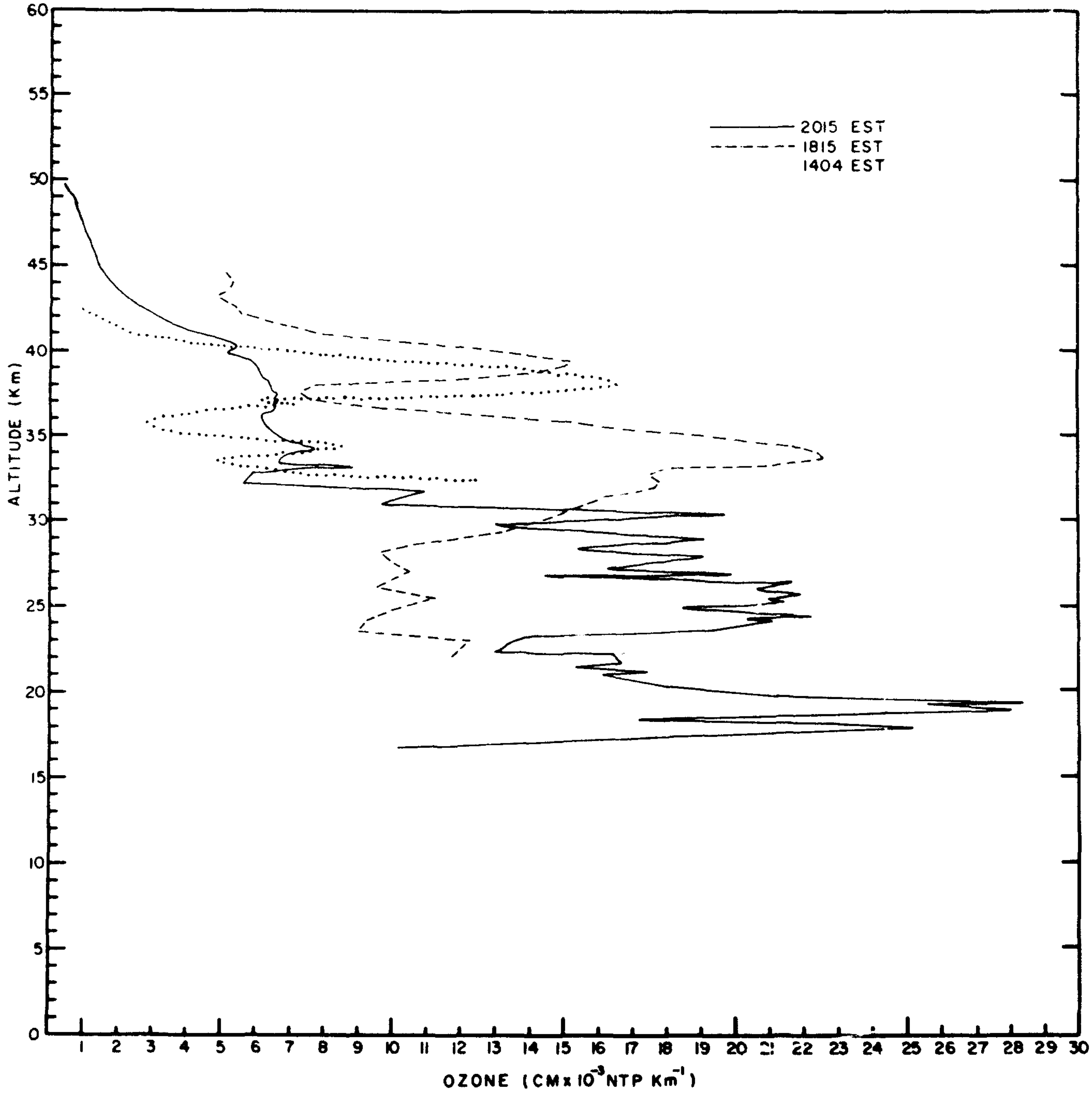


Figure 5. Ozone Concentration with Altitude as Obtained from Three Rocket Soundings on 7 March 1970.

compared to the 2015 EST sounding. The measurements made for the total ozone at Tallahassee during that week (Table II) show some variation from day to day. On 7 March, before the first contact, total ozone measured was 375 m-atm-cm, and just after the fourth contact it was measured to be 414 m-atm-cm, showing an increase of more than 10 percent. This is the first time so much increase in total ozone has been reported from measurements with a Dobson spectrophotometer due to a solar eclipse.

Temperature and Wind

Temperatures recorded on the day of the eclipse are shown in Figures 6 and 7. The thermal field shown in Figure 8 was analyzed from temperature values measured by the Arcasonde system. These analyses indicate that a marked warming was observed in the stratosphere during the partial solar eclipse. The temperatures observed near the time of totality in the lower and middle stratosphere are considerably higher than those observed during the previous afternoon. For example, the temperature difference is 9.1°C at 25 km, 12.4°C at 30 km, and 14.8°C at 35 km.

Several influences appear to be effective in altering the thermal structure during this time frame. A small portion of the heating can be attributed to the diurnal variation of the temperature. Beyers, Miers, and Reed [11] report that the time of maximum temperature over White Sands Missile Range, New Mexico, at 40 km in February is 1400 MST and the amplitude is only 2°C. Thus an increase of 12°C at 40 km during the partial eclipse cannot be ascribed to the diurnal variation.

The appearance of a weak anticyclone over the southeastern states on 7 March accounts for the relatively weak and disorganized circulation at the 10 mb level (Figure 10). Horizontal divergence along with warm air advection which is associated with this synoptic-scale system could well have been responsible for additional heating. Figures 9, 10, and 11 show the movement of this anticyclone at 10 mb from the Gulf of Mexico across southeastern United States.

Unfortunately, temperature and wind observations were not available above the stratopause level during the totality due to the effect of heavy rains on the radar acquisition of Arcasonde payloads and weak signals received by the ground-based GMD's. However, a similar experiment was conducted at Wallops Island, Virginia, during the eclipse [12]. Their temperature analyses showed cooling between 45 and 55 km altitude which they associated with the eclipse. It is reasonable to assume that this cooling existed at the same levels over Eglin AFB, Florida. There is thus the implication that this cooling gen-

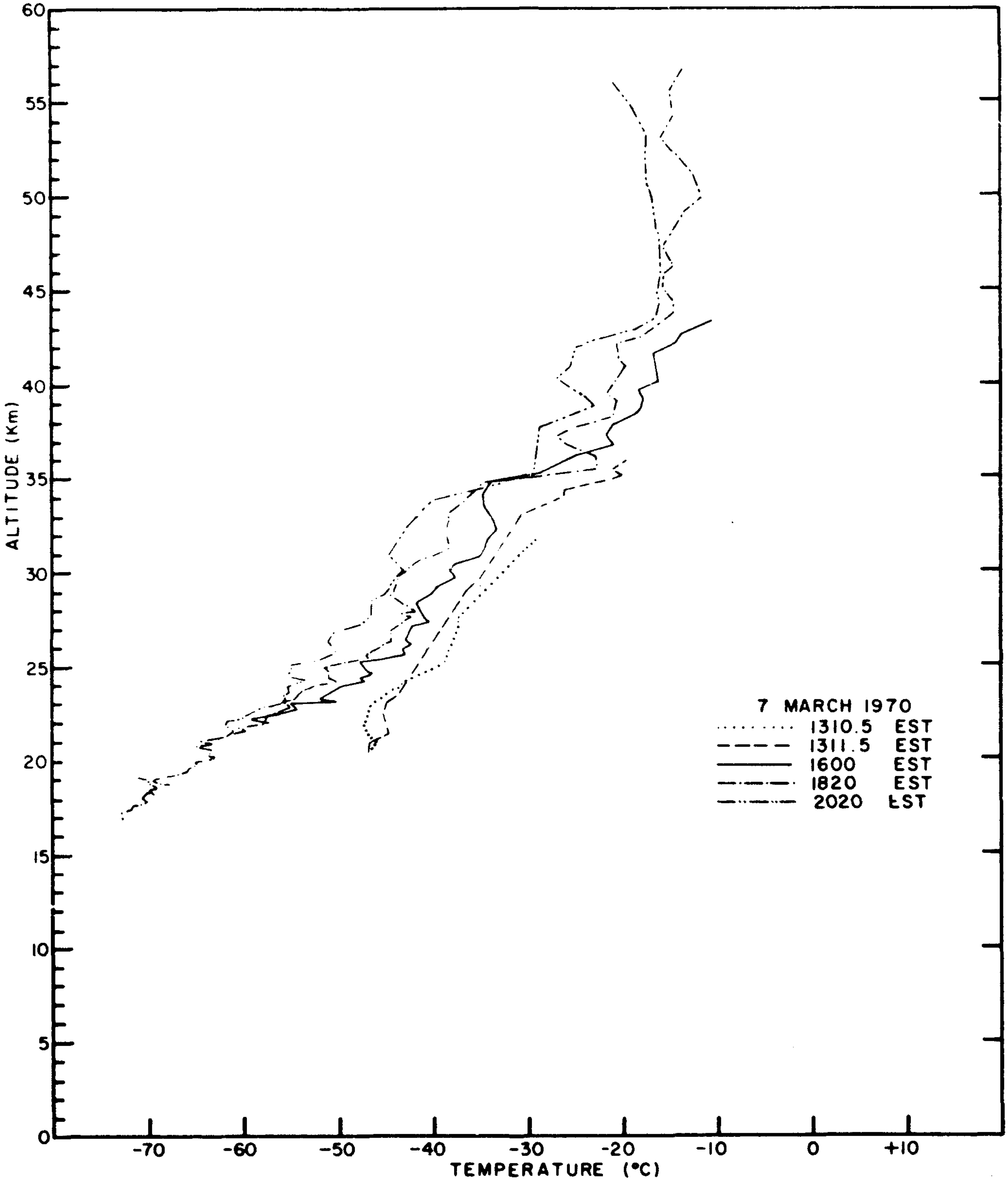


Figure 6. Temperature Data Obtained from Arcasonde 1A on 7 March 1970.

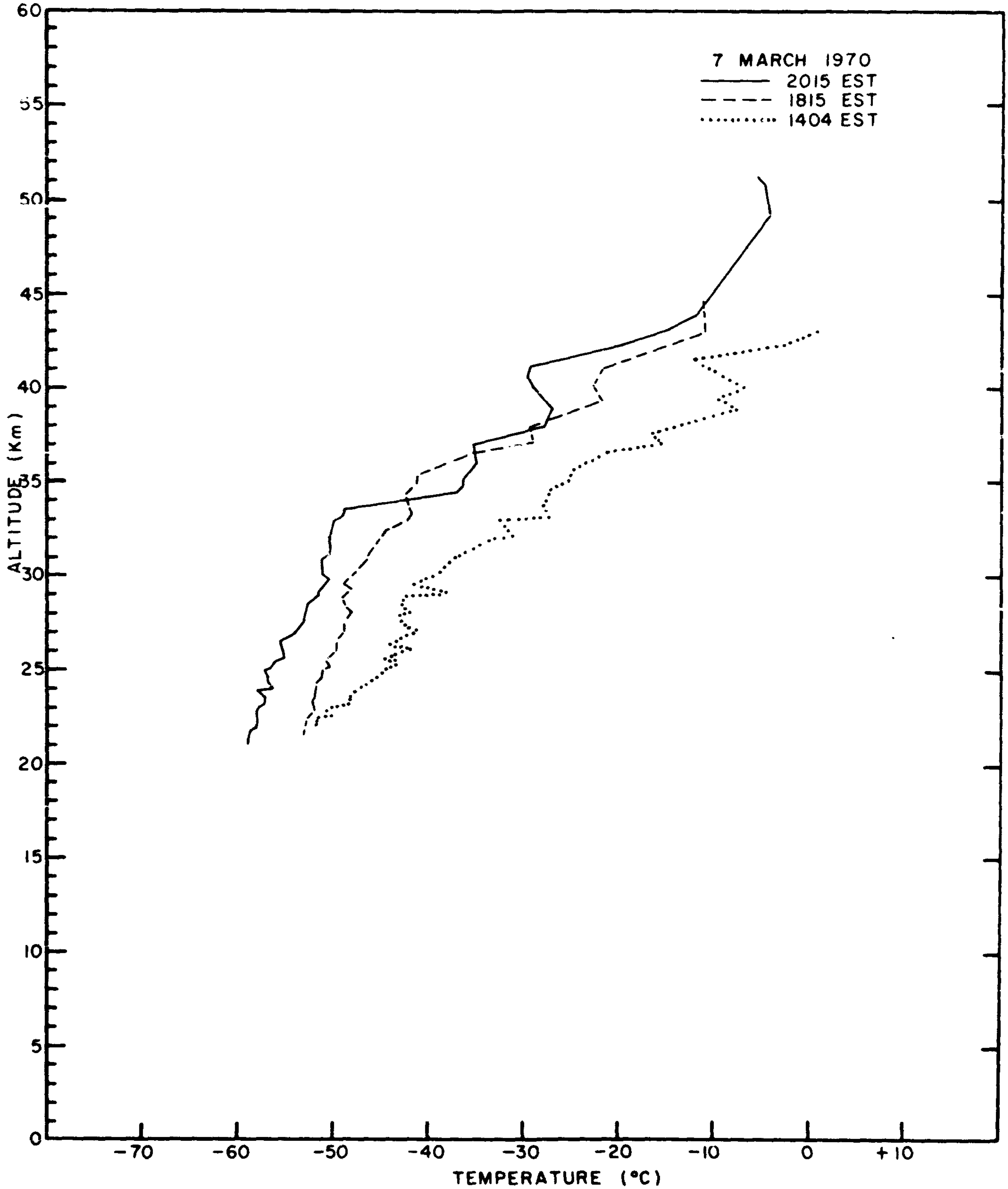


Figure 7. Temperature Data Obtained from STS-Ozone Sensor on 7 March 1970.

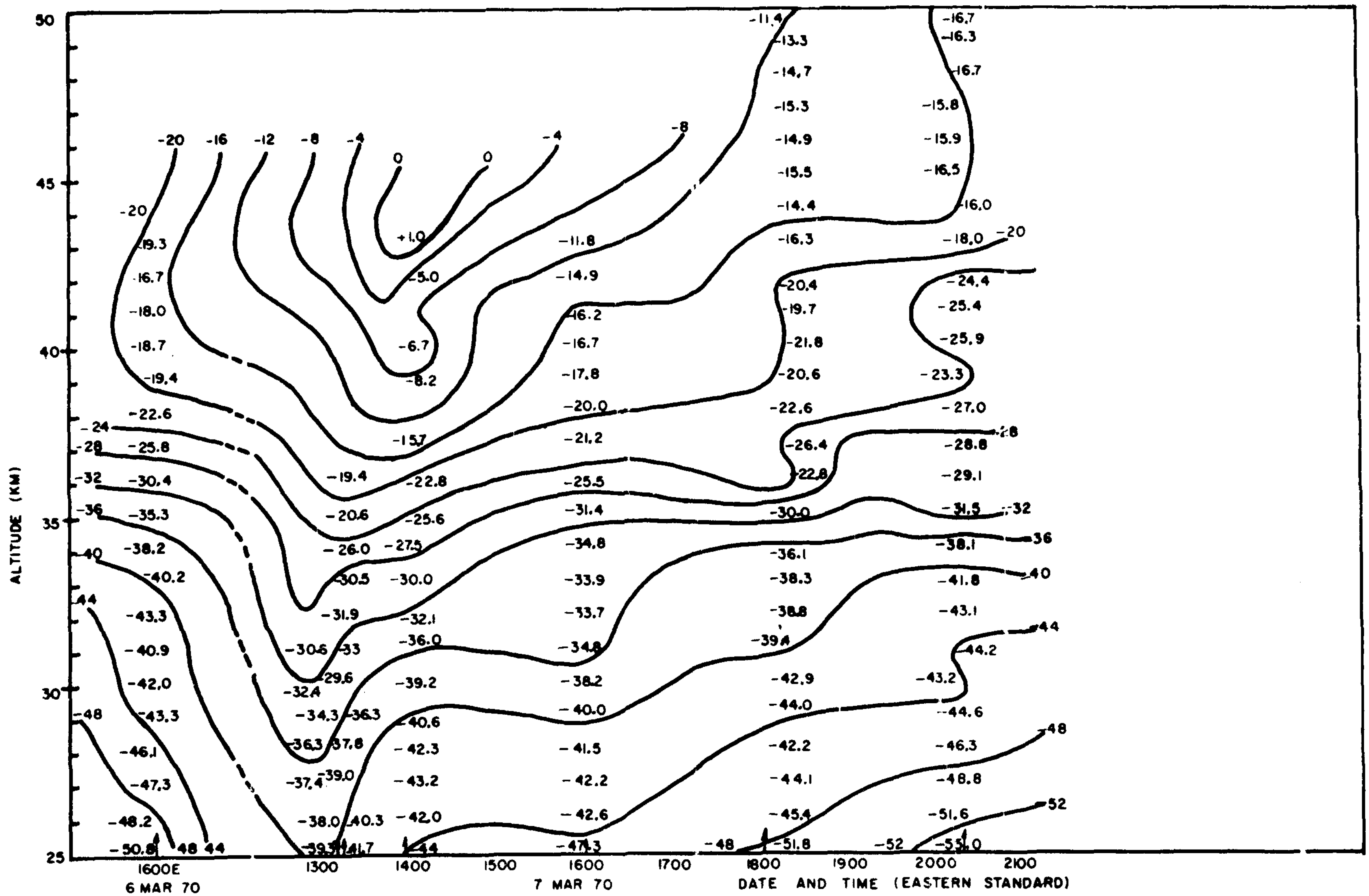


Figure 8. Isothermal Analysis of Temperature Data. Isotherms are drawn for intervals of 4°C. Only Arcasonde temperatures are included in this analysis.

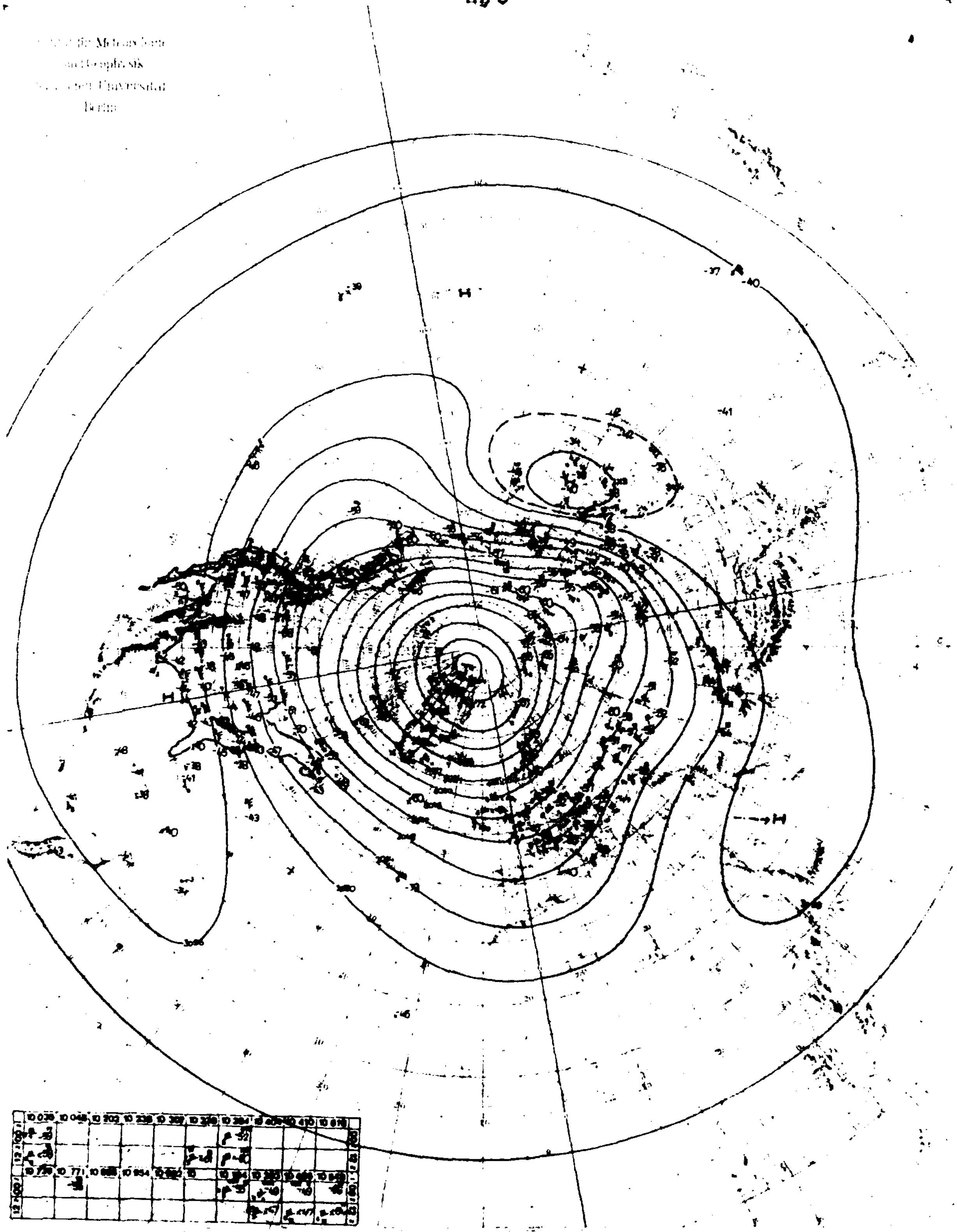


Figure 9. Ten Millibar Constant Pressure Analysis Provided by the Free University of Berlin for 6 March 1970.

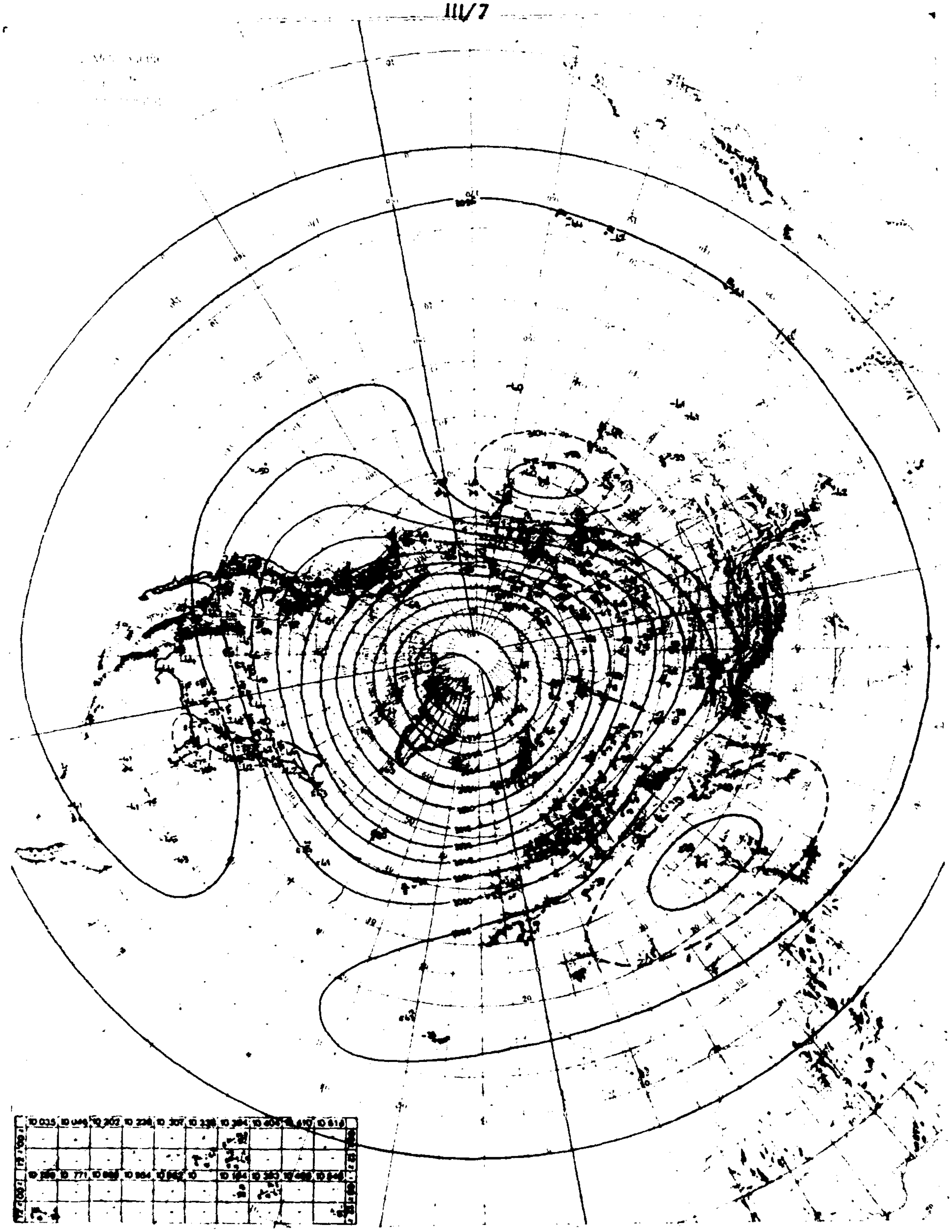


Figure 10. Ten Millibar Constant Pressure Analysis Provided by the Free University of Berlin for 7 March 1970.

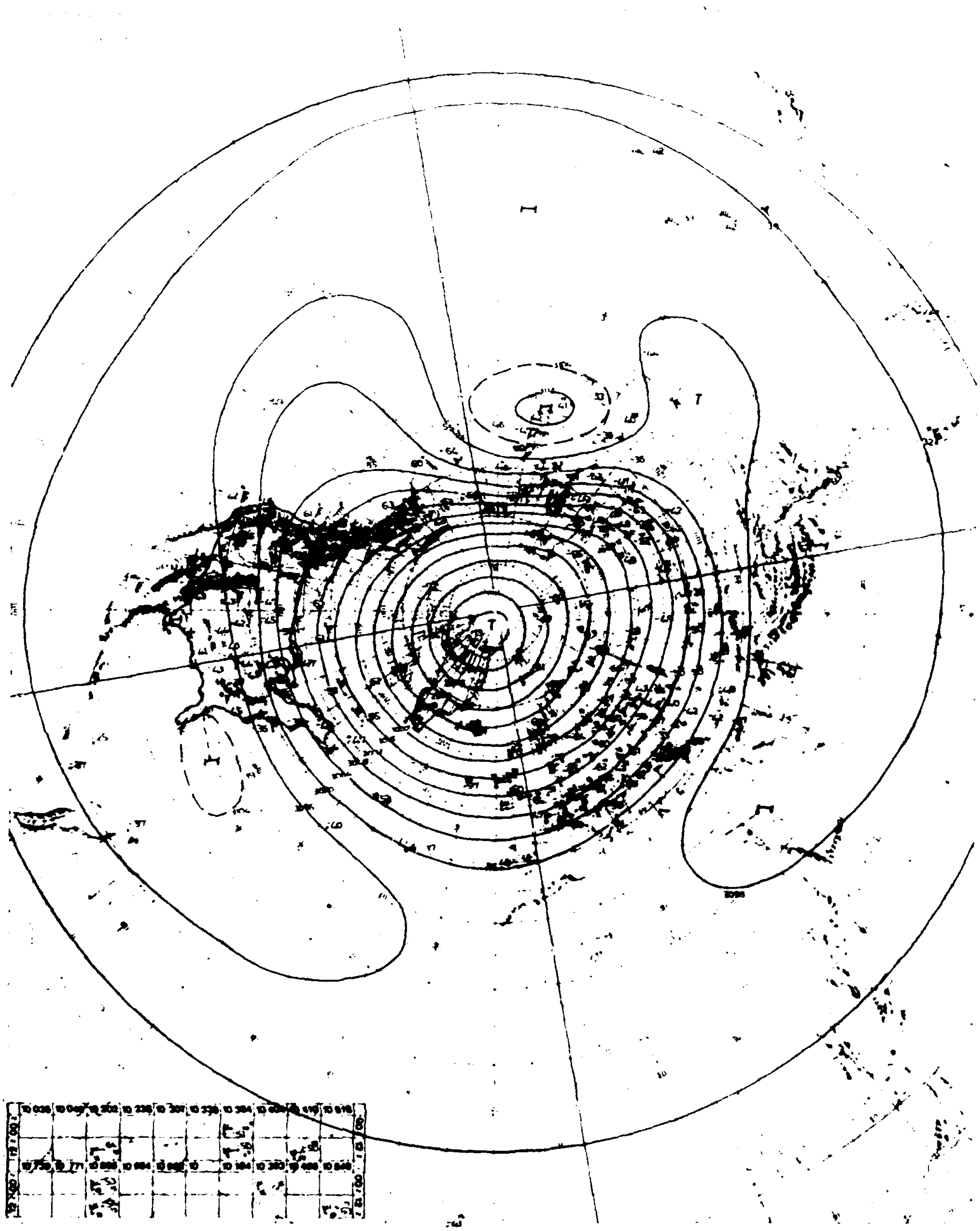


Figure 11. Ten Millibar Constant Pressure Analysis Provided by the Free University of Berlin for 8 March 1970.

erated downward motion and subsequent compressional heating in the upper and middle stratosphere (below 45 km).

In general, the zonal wind components (Figure 12) and meridional wind components (Figure 13) are characterized by a weak and variable flow during 6 and 7 March. The mean component winds for March at Cape Kennedy, Florida, based on a five-year period, 1964-1968, show south and west winds prevailing throughout the stratosphere [13]. The only apparent correlation between changes in the wind field and the solar eclipse was the occurrence of a marked minimum in the west winds during the partial eclipse from 36 to 40 km.

CONCLUSIONS

The experimental study made at Eglin Air Force Base, Florida, indicates that the solar eclipse produced a significant perturbation in the stratosphere. The observations obtained during this period show that there was an appreciable increase in temperature, decrease in zonal wind field, and increase in ozone concentration. This ozone concentration increase persisted for at least four hours. A comparatively large increase in total ozone appears to have resulted due to the eclipse.

ACKNOWLEDGMENTS

The authors wish to acknowledge the help received from the personnel of Schellenger Research Laboratories, the University of Texas at El Paso, who contributed to the success of this study. Special thanks are due Mr. John Frei for instrument development and Mr. John Sisson for data reduction.

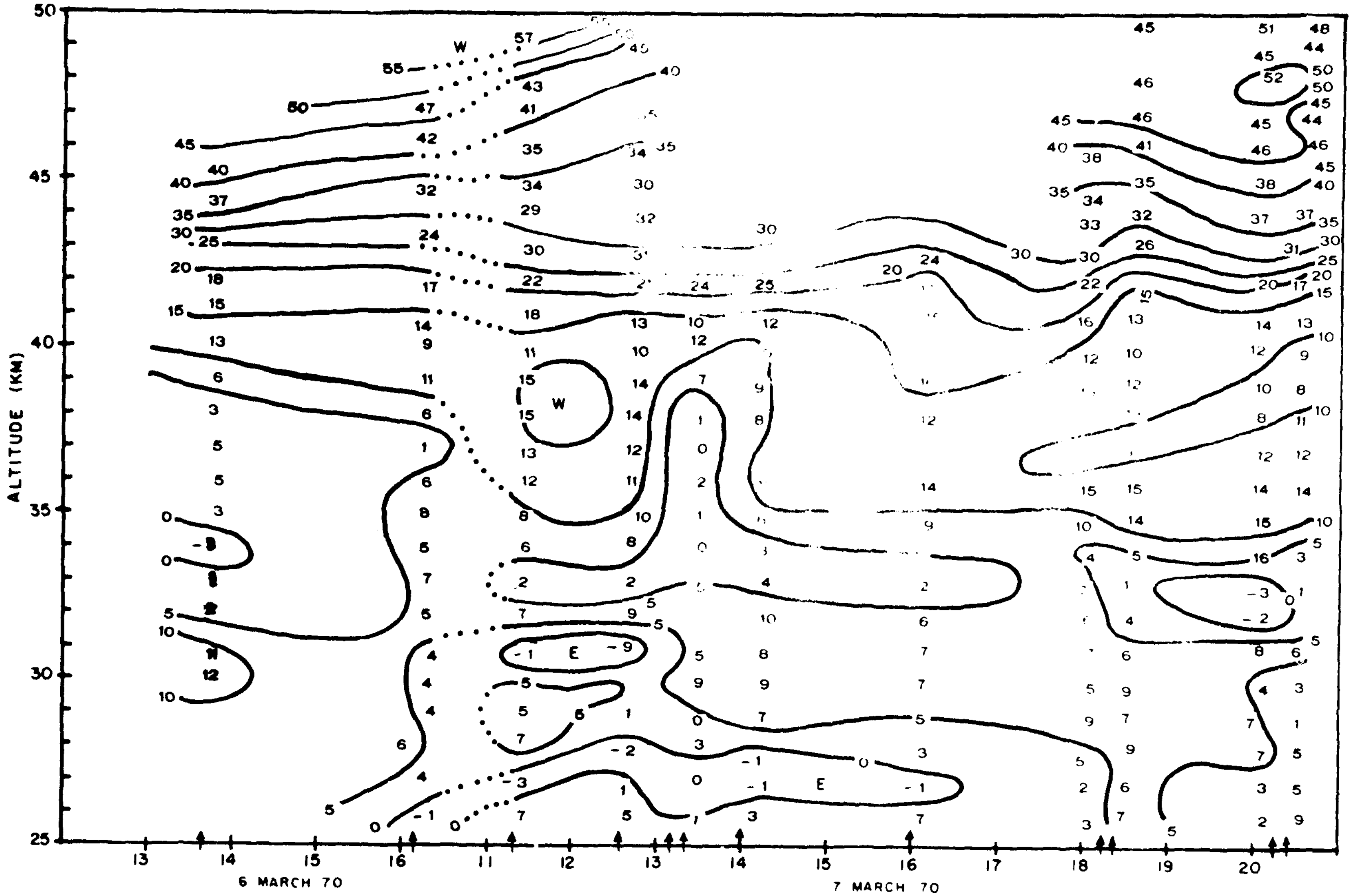


Figure 12. Zonal Wind Component (m sec^{-1}). Position of arrows represents approximate time (EST) of rocket observation.

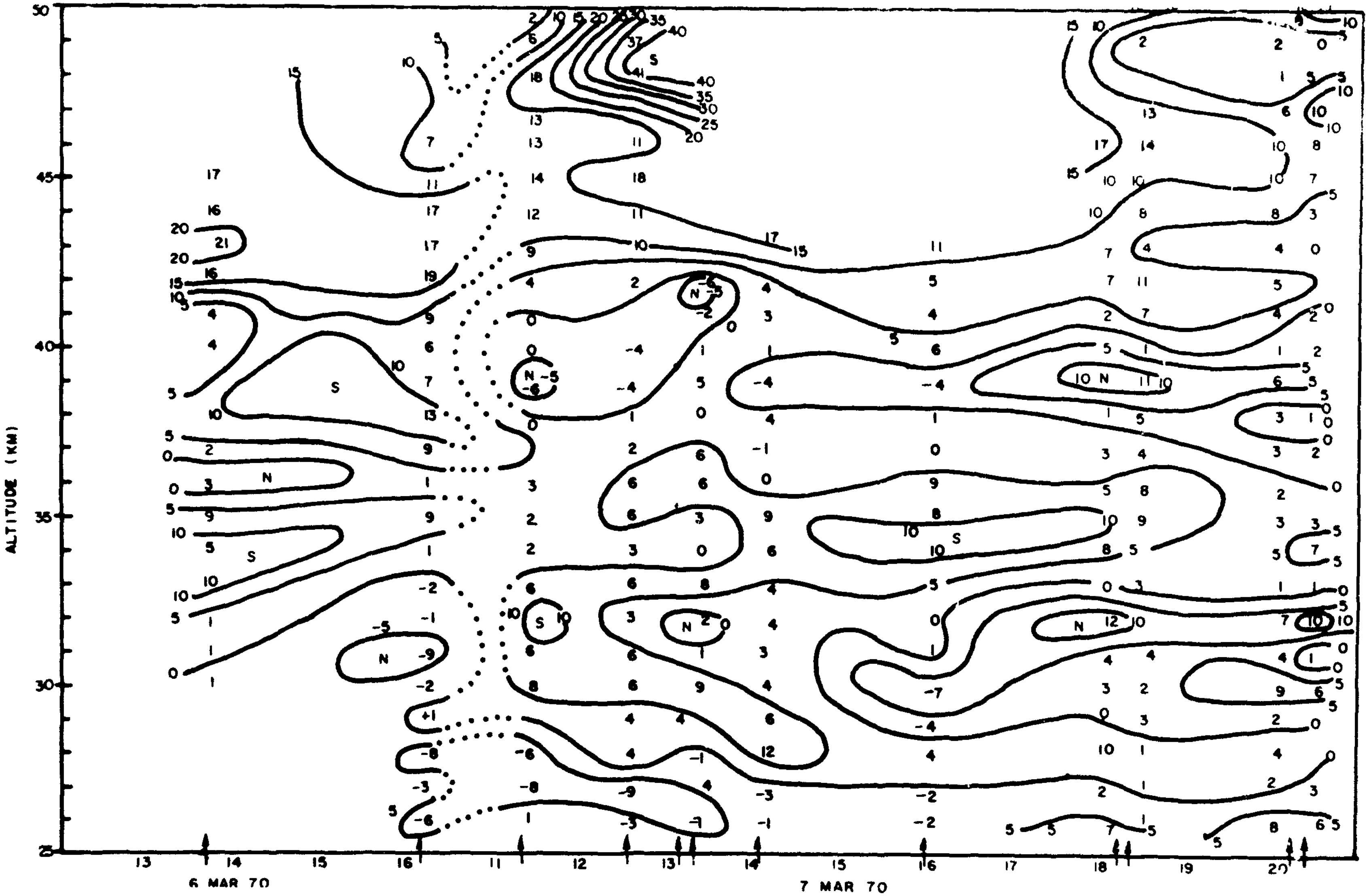


Figure 13. Meridional Wind Component (m sec^{-1}). Position of arrows represents approximate time (EST) of rocket observation.

LITERATURE CITED

1. Stranz, D., 1961, "Ozone Measurements During Solar Eclipse," Tellus, 13, 276.

2. Bojkov, R. D., 1968, "The Ozone Variation During the Solar Eclipse of 20 May 1966," Tellus, 20, 417.

3. Randhawa, J. S., 1968, "Mesospheric Ozone Measurements During a Solar Eclipse," J. Geophy. Res., 75, 493-495.

4. Beyers, N. J., and B. T. Miers, 1965, "Diurnal Temperature Change in the Atmosphere Between 30 and 60 Kilometers over White Sands Missile Range," J. Atmos. Sci., 22, 262-266.

5. Miers, B. T., 1965, "Wind Oscillations Between 30 and 60 Kilometers over White Sands Missile Range, New Mexico," J. Atmos. Sci., 22, 282-287.

6. Randhawa, J. S., 1967, "Ozonesonde for Rocket Flight," Nature 213, 53-54.

7. Regener, V. H., 1964, "Measurement of Atmospheric Ozone with the Chemiluminescent Method," J. Geophy. Res., 69, 3795-3800.

8. Atlantic Research Corporation, 1960, "Arcas Rocketsonde System, High Altitude and Meteorological Sounding Rocket."

9. Brewer, A. W., and J. R. Milford, 1960, "The Oxford-Kew Ozonesonde," Proc. Roy. Soc., A 256, 470-495.

10. Hunt, B. G., 1965, "A Theoretical Study of the Changes Occurring in the Ozonesphere During a Total Eclipse of the Sun," Tellus, 17, 516.

11. Beyers, N. J., B. T. Miers, and R. J. Reed, 1966, "Diurnal Tidal Motions Near the Stratopause During 48 Hours at White Sands Missile Range," J. Atmos. Sci., 23, 325-333.

12. Henry, R. M., and R. S. Quiroz, 1970, "Preliminary Results From a Meteorological Rocket Experiment," Nature, 226, 1108-1110.

13. World Data Center A, March 1968, "Data Report - Meteorological Rocket Network Firing," Vol. V, No. 3.

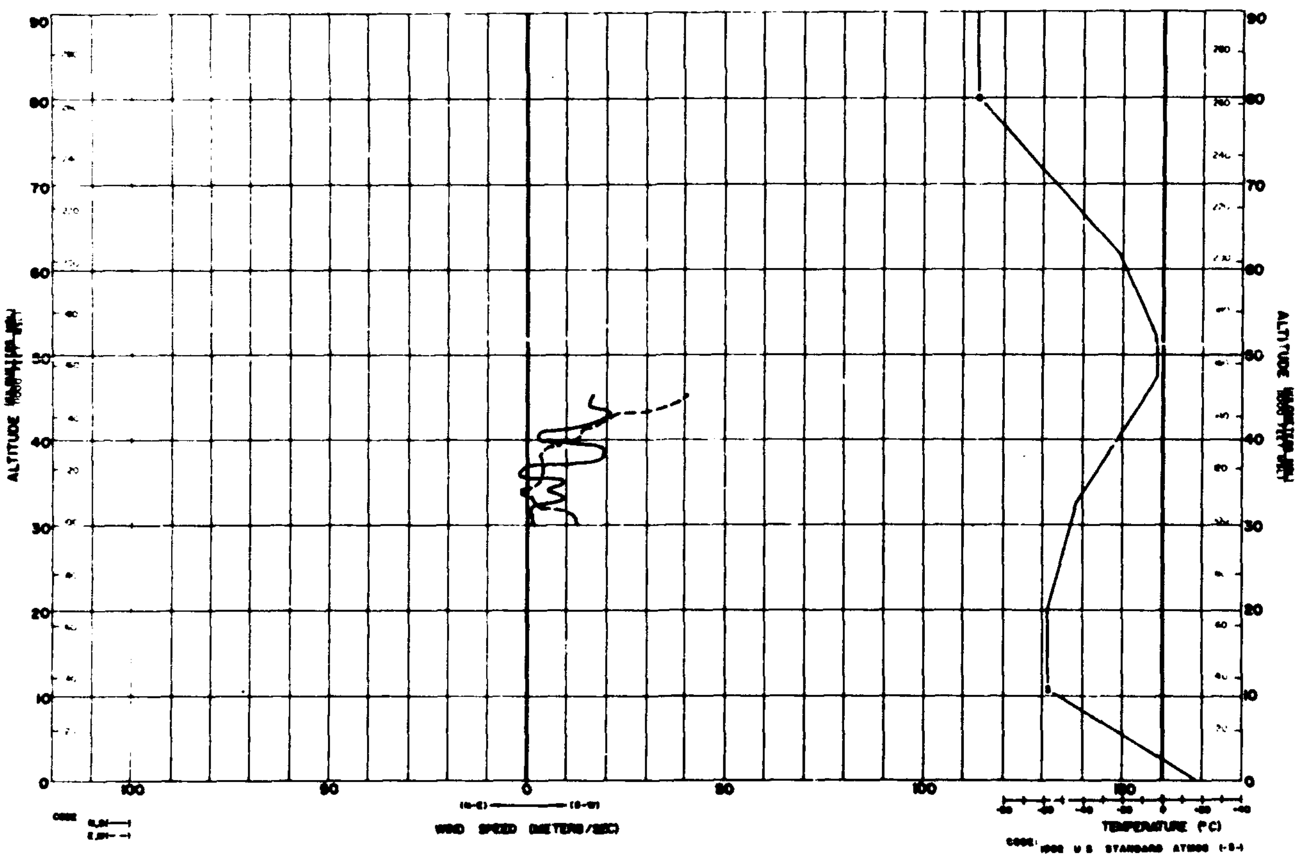
APPENDIX A

METEOROLOGICAL ROCKET SOUNDING DATA

METEOROLOGICAL ROCKET SOUNDING DATA

EGLIN AFB. FLORIDA ARCAS 1 6 MARCH 197[illegible] 1339 EST ARCASONDE

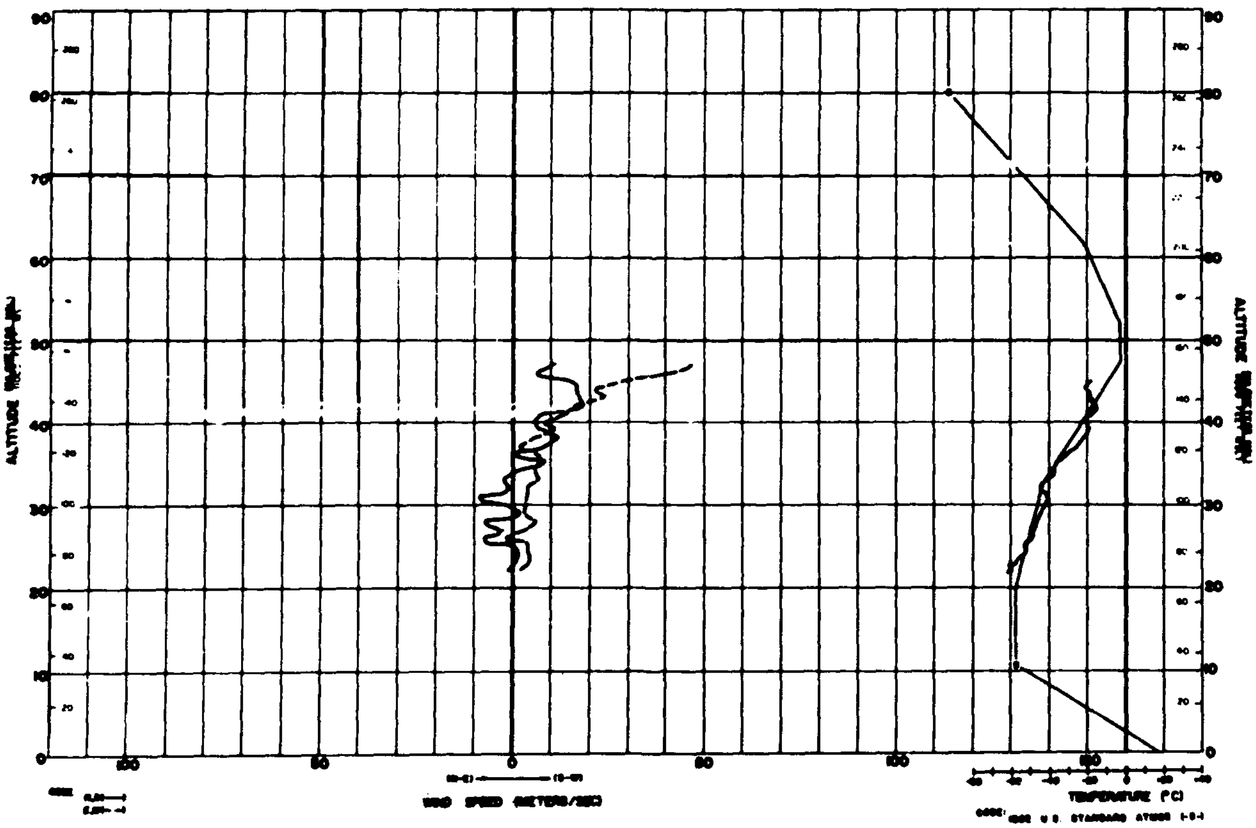
ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C
45.00	16.[illegible]	40.28	
44.[illegible]	1[illegible].[illegible]1	[illegible]7.18	
4[illegible]	[illegible]1.11	[illegible]5.58	
4[illegible]	15.9[illegible]	18.56	
41.[illegible]	4.15	14.71	
4[illegible]	4.11	15.45	
[illegible]	4.55	5.75	
[illegible]	9.85	3.[illegible]4	
[illegible]	1.[illegible]	4.[illegible]9	
[illegible]	-[illegible].54	4.66	
[illegible]	9.15	5.45	
[illegible]4.[illegible]	[illegible].55	-1.[illegible]7	
[illegible]5.[illegible]	9.75	.5[illegible]	
[illegible]	1.52	.[illegible]8	
[illegible]1.[illegible]	.98	11.[illegible]	
[illegible]	1.[illegible]1	1.[illegible]6	



METEOROLOGICAL ROCKET SOUNDING DATA

EGLIN AFB, FLORIDA   ARCAS 2   6 MARCH 1970   1610 EST   ARCASONDE

ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C
47.00	10.71	46.71	
46.00	6.50	42.48	
45.00	11.45	32.15	
44.00	17.38	22.88	-20.0
43.00	17.44	24.90	-19.3
42.00	18.94	17.51	-16.7
41.00	8.92	14.00	-18.0
40.00	5.81	9.28	-20.0
39.00	6.51	10.55	-19.2
38.00	12.52	5.79	-25.0
37.00	9.51	1.17	-26.0
36.00	.45	6.05	-30.6
35.00	8.55	7.91	-35.2
34.00	1.51	5.26	-38.5
33.00	-2.46	6.55	-40.2
32.00	-.44	4.80	-45.1
31.00	-8.56	4.45	-41.2
30.00	-2.18	3.92	-42.1
29.00	1.15	3.62	-43.2
28.00	-6.76	3.72	-45.0
27.00	-3.30	4.00	-47.1
26.00	-6.25	-1.39	-48.7
25.00	-.70	4.37	-51.5
24.00	.51	4.65	-54.9
23.00	.26	4.92	-56.8
22.00	-.75	2.98	-59.5



METEOROLOGICAL ROCKET SOUNDING DATA

EGLIN AFB, FLORIDA ARCAS 1 7 MARCH 1970 1121 [illegible] ARCASONDE

ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C
50.00	2.13	46.06	
49.00	5.85	57.15	
48.00	17.85	42.95	
47.00	13.84	42.25	
46.00	12.94	35.39	
45.00	14.28	33.59	
44.00	12.07	29.25	
43.00	8.57	29.91	
42.00	4.01	22.16	
41.00	-.18	17.98	
40.00	.19	10.63	
39.00	-6.15	15.13	
38.00	-.08	14.57	
37.00	7.20	13.25	
36.00	3.20	11.63	
35.00	1.73	7.92	
34.00	2.01	5.64	
33.00	6.30	1.91	
32.00	10.21	7.31	
31.00	6.45	-1.35	
30.00	8.08	5.47	
29.00	-1.32	5.01	
28.00	-6.50	6.74	
27.00	-8.36	-3.01	
26.00	.55	6.50	
25.00	.41	4.12	
24.00	-6.94	-1.76	
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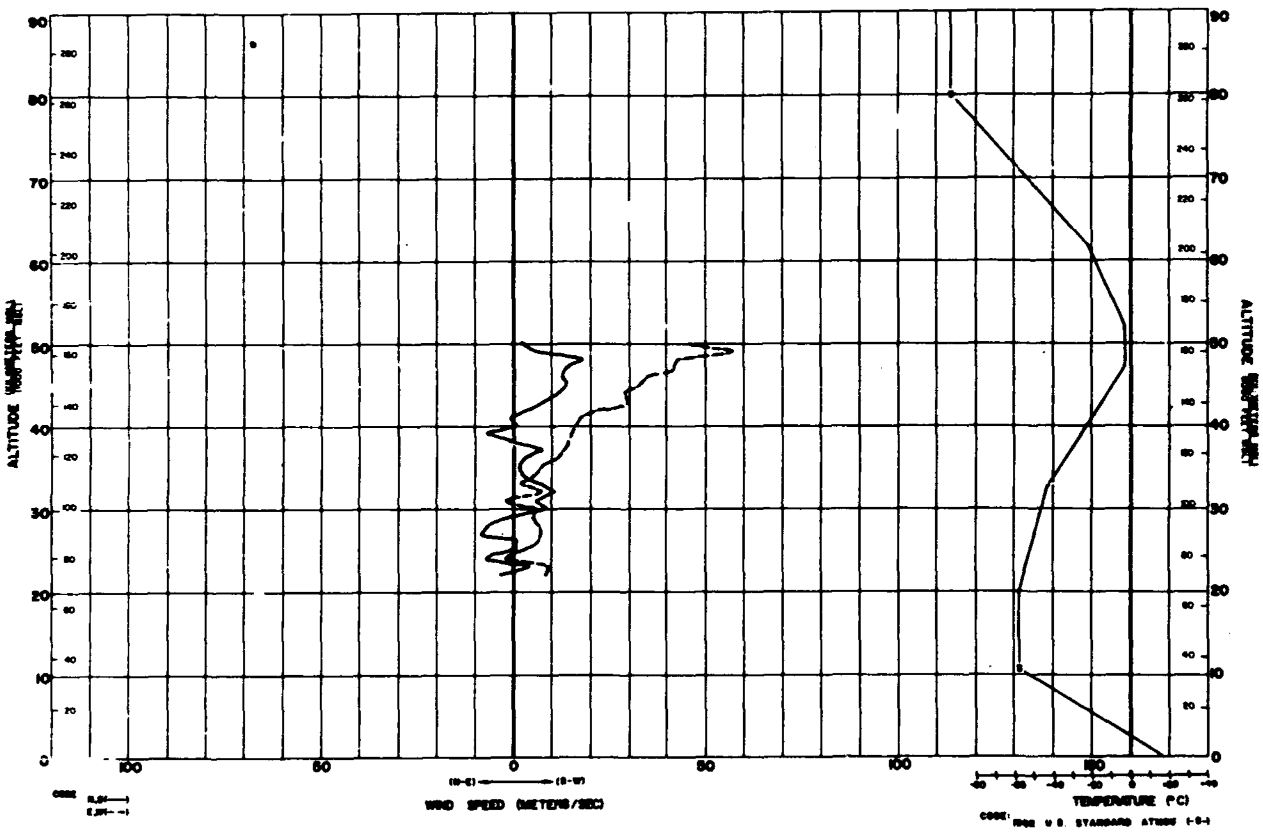
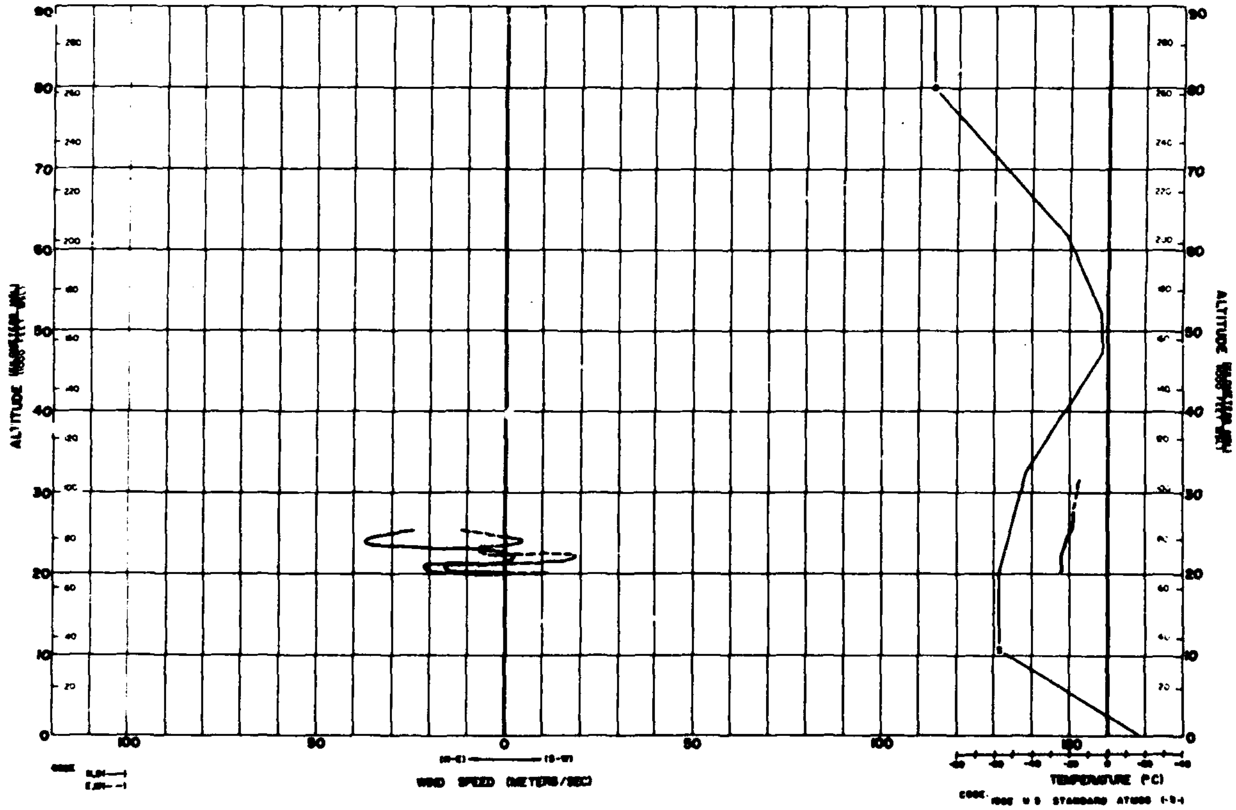
22.00	-3.94	9.25	



METEOROLOGICAL ROCKET SOUNDING DATA

EGLIN AFB, FLORIDA   ARCAS 2   7 MARCH 1970   1310.5 GMT   ARCASONDE

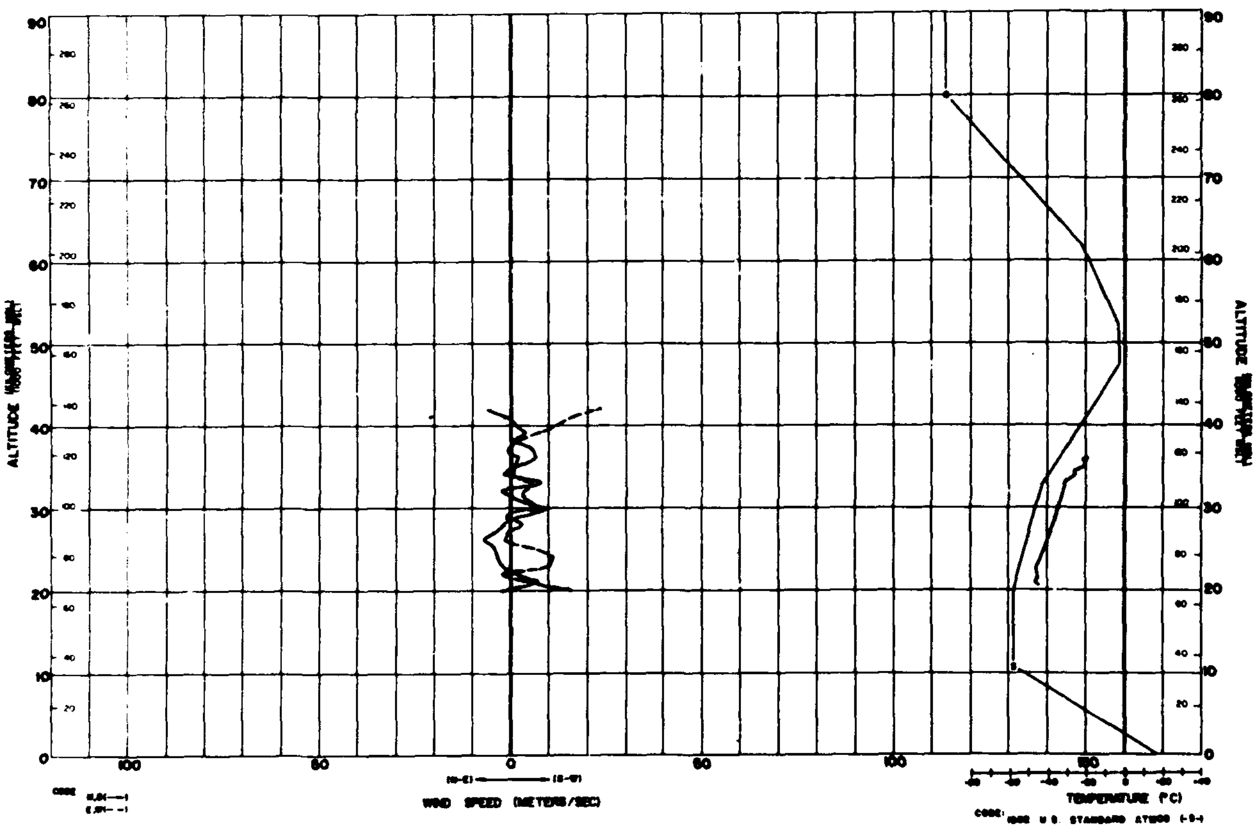
ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C
25.00	-24.79	-12.73	-39.8
24.00	-37.35	4.96	-43.3
23.00	-21.21	7.75	-46.3
22.00	2.84	18.70	-47.2
21.00	-20.31	-15.42	-46.1
20.00	2.71	10.16	



METEOROLOGICAL ROCKET SOUNDING DATA

EGLIN AFB, FLORIDA ARCAS 5 7 MARCH 1970 1311.5 [illegible] ARCASONDE

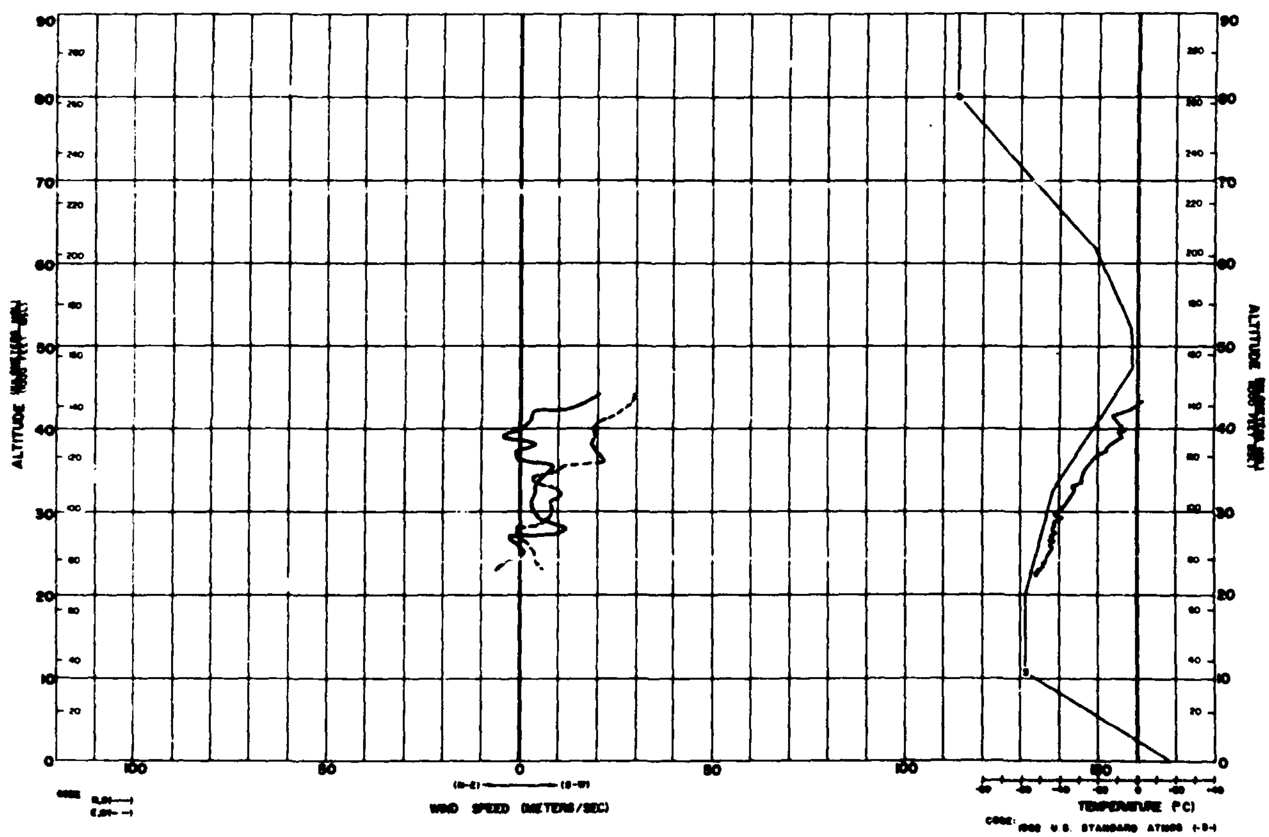
ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C
42.00	-5.97	23.56	
41.00	-1.56	10.03	
40.00	.86	12.08	
39.00	4.69	7.17	
38.00	.19	1.18	
37.00	5.81	-.18	
36.00	6.35	1.50	
35.00	2.96	1.17	-20.5
34.00	-.17	.14	-26.4
33.00	7.79	5.19	-30.5
32.00	-1.98	4.22	-31.9
31.00	.87	4.54	-33.1
30.00	9.25	9.16	-34.7
29.00	4.23	-.27	-36.2
28.00	-1.12	3.26	-37.8
27.00	-4.12	-.23	-39.0
26.00	-6.84	-.71	-40.1
25.00	-4.74	4.42	-41.5
24.00	-3.84	11.78	-42.9
23.00	-2.31	10.16	-45.0
22.00	.63	-2.17	-44.9
21.00	6.97	1.57	-46.5
20.00	-1.58	16.56	



METEOROLOGICAL ROCKET SOUNDING DATA

EGLIN AFB, FLORIDA   ARCAS 4   7 MARCH 1970   1404 EST   STS-OZONESONDE

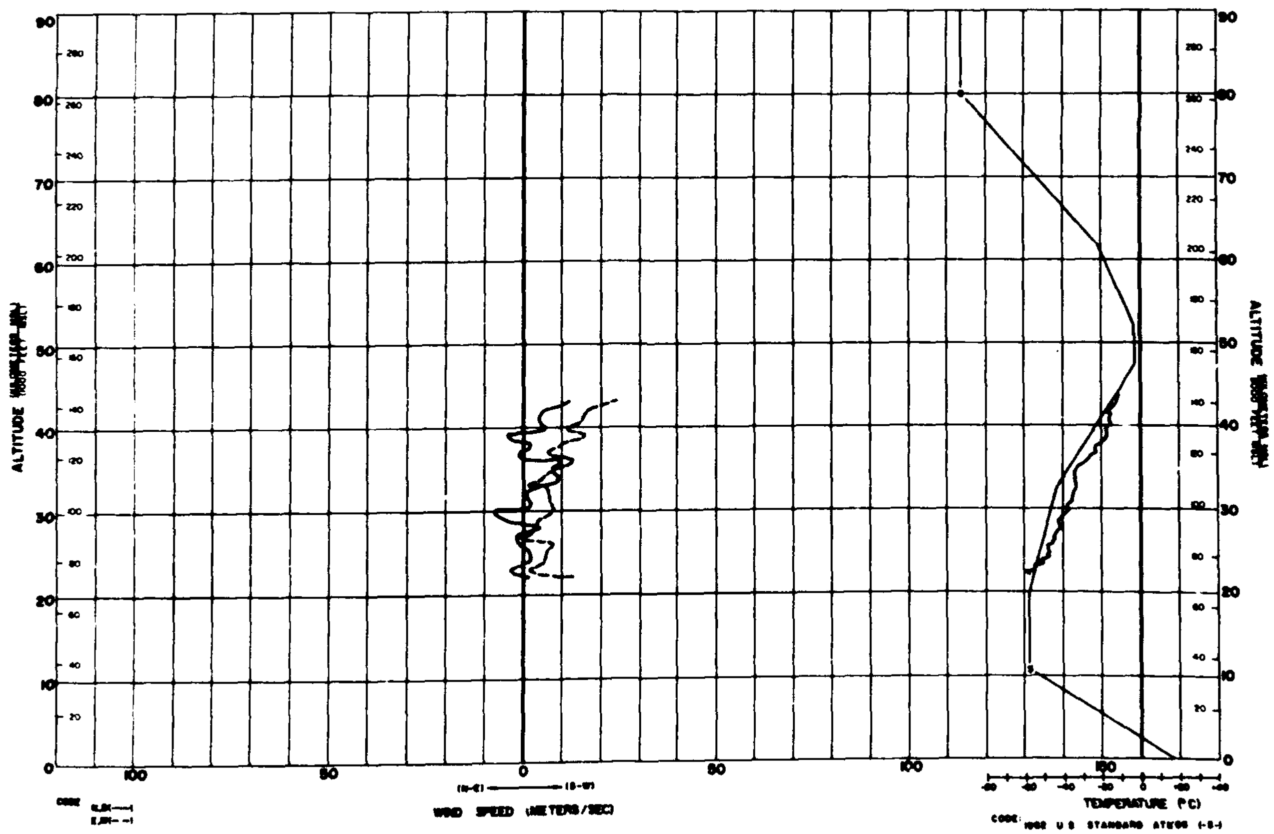
ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C	OZONE $CmO_3/Km \times 10^{-3}$
42.29	10.00	28.00	-2.3	.95
41.84	3.35	24.02	-7.0	1.38
41.41	3.20	18.00	-11.9	1.87
40.98	2.25	11.80	-10.5	2.34
40.56	2.75	10.10	-8.8	3.21
40.16	2.05	9.51	-8.0	5.00
39.76	.00	9.06	-8.0	7.39
39.37	-1.95	9.15	-9.0	9.89
38.99	-4.30	9.12	-8.1	13.00
38.62	-3.90	9.00	-8.7	14.42
38.25	1.00	8.58	-11.5	16.19
37.91	4.00	8.50	-14.4	16.53
37.57	2.00	8.85	-16.0	15.43
37.40	1.61	9.02	-16.4	14.09
37.24	.50	9.42	-16.3	12.59
36.91	-.96	9.95	-16.0	6.11
36.72	-.98	10.00	-17.9	7.05
36.59	-.99	9.31	-20.9	6.38
36.29	-.80	10.97	-22.2	4.37
35.99	-.48	11.15	-23.0	3.23
35.55	2.60	8.94	-24.9	2.82
35.12	5.85	6.00	-25.0	3.01
34.70	7.75	4.59	-26.0	4.81
34.28	6.70	3.60	-27.3	8.39
33.88	5.50	3.30	-27.7	7.15
33.49	5.00	3.83	-27.8	4.87
33.12	4.86	4.00	-27.5	5.36
32.77	4.18	5.36	-32.5	7.45
32.11	4.05	8.80	-31.7	12.63



METEOROLOGICAL ROCKET SOUNDING DATA

EGLIN AFB, FLORIDA — ARCAS 5 — 7 MARCH 1970 — 1600 [illegible] — ARCASONDE

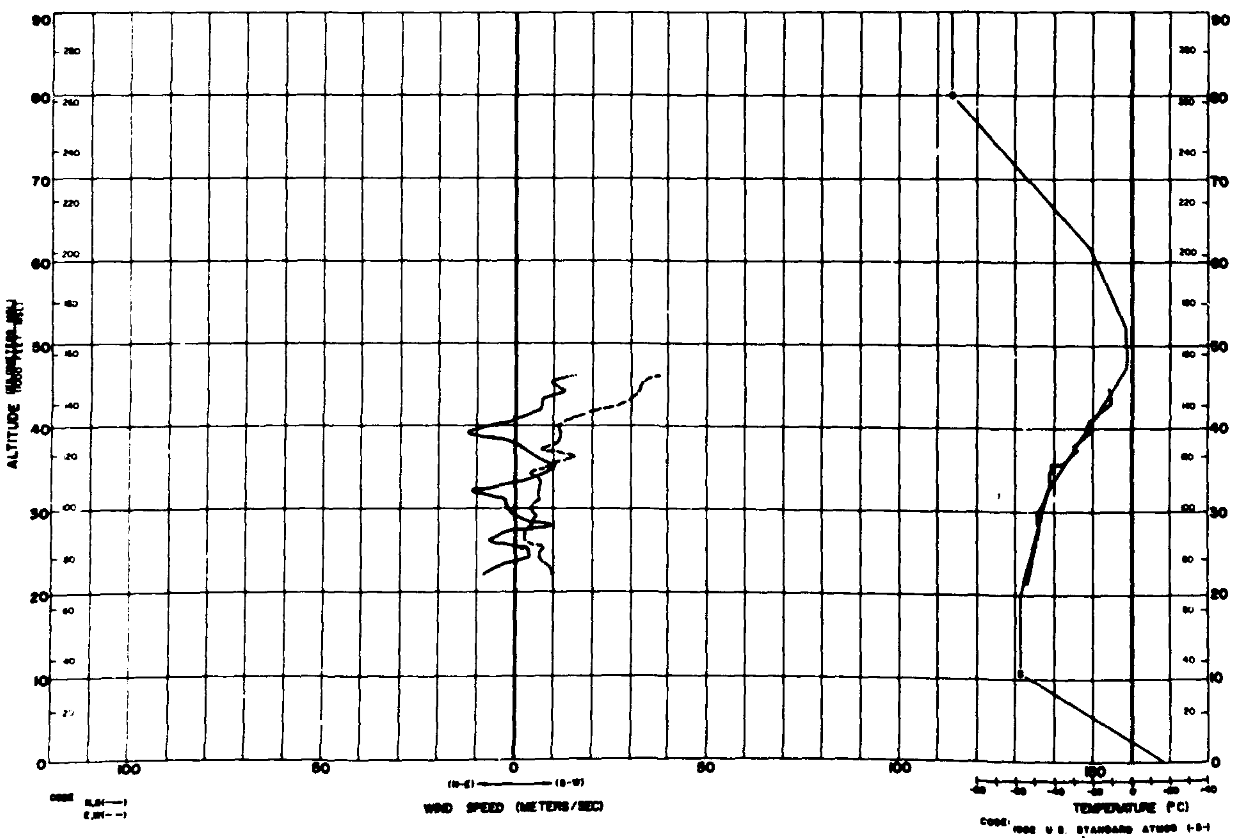
ALTITUDE KM	-N +S VELOCITY M/SEC	-E +W VELOCITY M/SEC	TEMPERATURE °C
43.00	11.31	24.19	-11.7
42.00	5.04	17.04	-14.9
41.00	4.48	15.09	-16.2
40.00	5.65	11.64	-16.7
39.00	-4.05	15.53	-17.8
38.00	.79	11.74	-20.0
37.00	-.36	7.21	-21.0
36.00	9.07	13.55	-25.6
35.00	7.94	8.72	-30.0
34.00	9.78	5.16	-34.9
33.00	5.04	1.73	-33.9
32.00	.05	6.32	-33.7
31.00	1.28	6.92	-35.0
30.00	-7.33	7.28	-38.0
29.00	-4.56	4.86	-40.1
28.00	4.28	2.65	-41.3
27.00	-2.46	-1.27	-42.1
26.00	-2.16	7.17	-43.0
25.00	1.27	6.74	-47.2
24.00	1.51	5.80	-49.0
23.00	-3.27	2.51	-50.0
22.00	.93	13.33	-57.8



METEOROLOGICAL ROCKET SOUNDING DATA

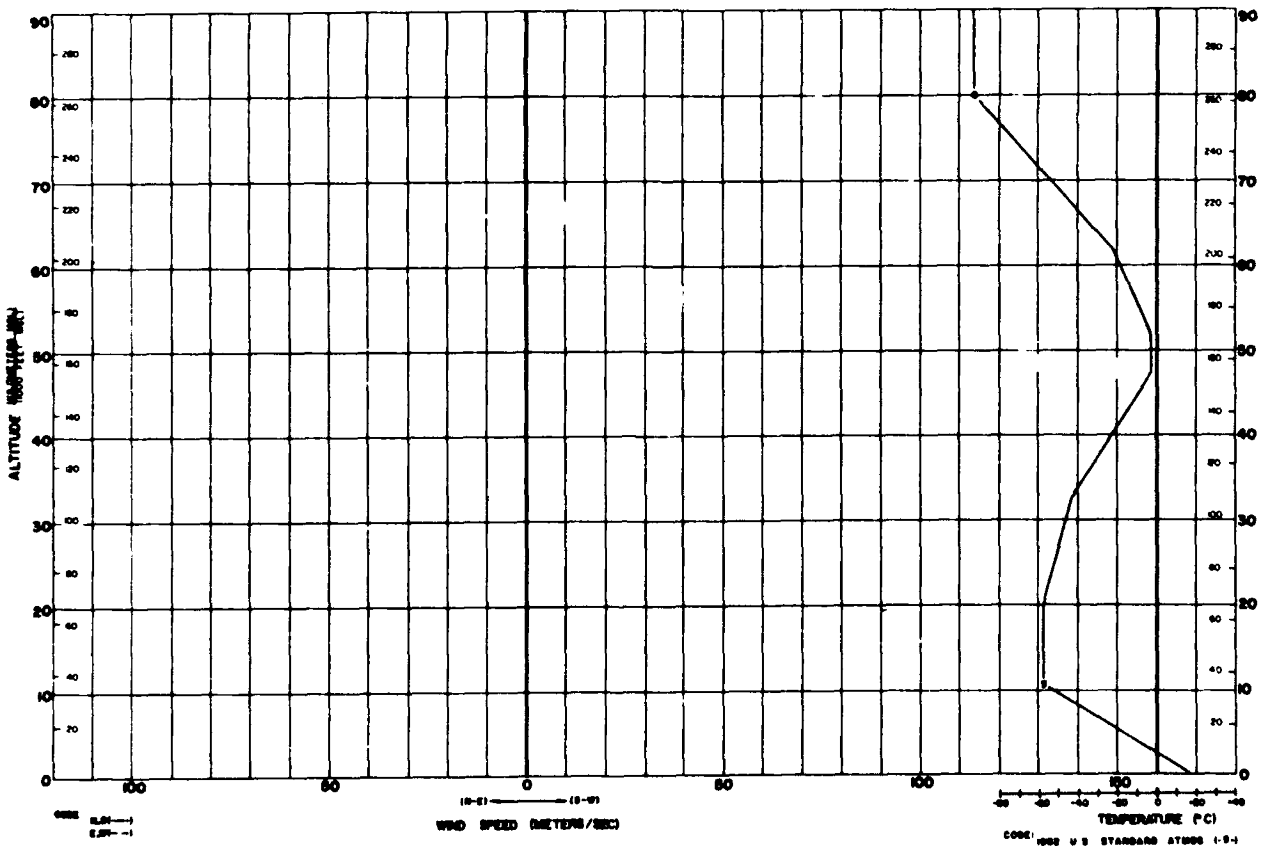
EGLIN AFB, FLORIDA ARCAS 6 7 MARCH 1970 1815 [illegible] STS-OZONESONDE

ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C	OZONE $CmO_3/Km \times 10^{-3}$
44.31	12.05	33.19	-11.0	5.02
44.00	13.15	32.98	-11.0	5.18
43.69	12.69	32.50	-10.9	5.18
43.39	10.50	31.01	-10.8	5.14
43.09	8.85	30.14	-10.8	5.06
42.81	7.25	29.00	-10.7	4.80
42.52	7.20	25.00	-12.9	5.18
42.25	7.19	23.02	-14.0	5.36
41.98	7.00	21.30	-16.0	5.44
41.71	6.00	20.00	-17.0	5.85
41.45	4.10	18.03	-19.0	6.22
41.19	3.19	17.00	-20.2	6.68
40.69	.11	15.00	-21.8	7.12
40.20	-4.30	12.99	-22.4	10.12
39.73	-8.56	12.25	-22.1	12.26
39.28	-11.58	12.76	-21.6	14.21
38.98	-12.30	12.95	-23.0	15.11
38.84	-11.96	12.90	-24.0	15.11
38.41	-8.09	12.87	-26.0	14.14
37.99	-2.00	12.66	-28.7	11.44
37.58	.59	11.00	-29.3	7.65
37.20	1.99	9.10	-29.0	7.24
36.82	2.87	7.30	-31.0	7.58
36.45	3.75	10.50	-35.4	9.26
36.10	4.25	11.89	-37.5	10.80
35.75	5.23	14.25	-39.0	12.38
35.42	7.01	11.61	-40.7	15.00
35.08	9.13	9.13	-41.1	15.94
34.76	9.85	8.00	-41.6	17.66
34.45	9.00	6.25	-42.0	19.58
34.22	8.50	5.00	-42.4	20.70
33.92	7.00	4.10	-42.1	21.75
33.65	5.51	4.75	-42.0	22.28
33.28	7.21	6.25	-44.4	22.50
32.95	-.85	7.29	-42.0	20.96
32.62	-2.75	6.99	-42.8	18.08
32.30	-6.90	6.29	-44.5	17.44
31.98	-11.00	6.30	-44.9	17.74
31.67	-9.50	6.52	-45.3	17.62
31.38	-6.00	6.50	-45.6	[illegible]



ARCAS 6 7 MARCH 1970
(CONTINUED)

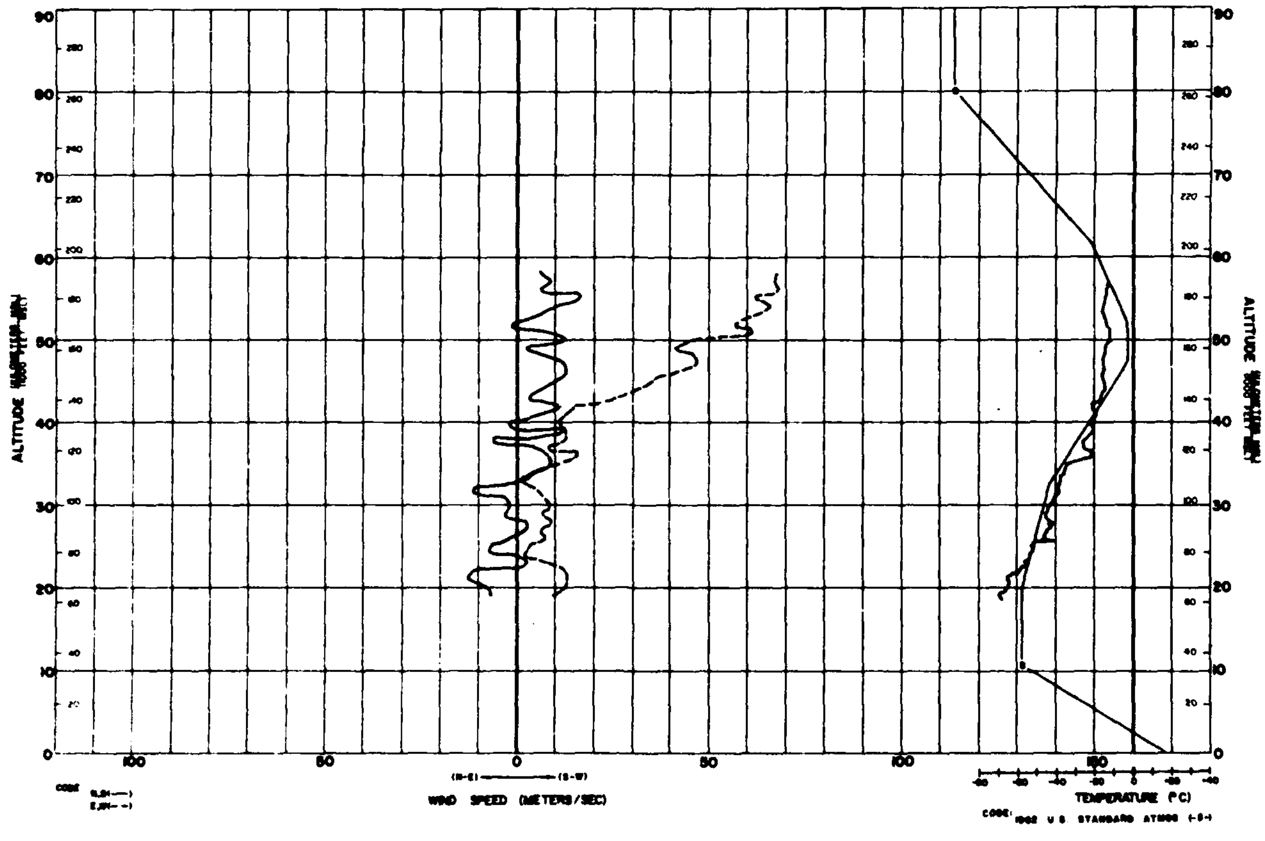
ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C	OZONE $CmO_3/Km \times 10^{-3}$
31.09	-3.79	6.50	-46.1	16.09
30.54	-3.32	5.11	-46.9	15.52
30.00	-3.28	4.57	-47.9	14.70
29.50	-1.85	5.09	-48.8	13.99
29.03	-.27	5.75	-48.4	13.16
28.58	4.00	5.80	-48.8	11.59
28.14	8.20	4.92	-48.0	10.35
27.70	9.00	3.90	-48.3	9.56
27.27	3.93	3.93	-48.4	9.82
26.66	-3.98	2.50	-49.0	10.42
25.76	-4.00	2.75	-49.9	9.45
25.10	2.00	5.32	-50.4	11.10
24.45	3.13	6.90	-51.3	9.79
23.83	3.20	6.25	-51.7	9.15
23.28	-2.60	7.21	-52.0	8.96
22.57	-5.96	8.99	-52.1	12.15
21.89			-52.9	11.62



METEOROLOGICAL ROCKET SOUNDING DATA

EGLIN AFB, FLORIDA | ARCAS 7 | 7 MARCH 1970 | 1820 GMT | ARCASONDE

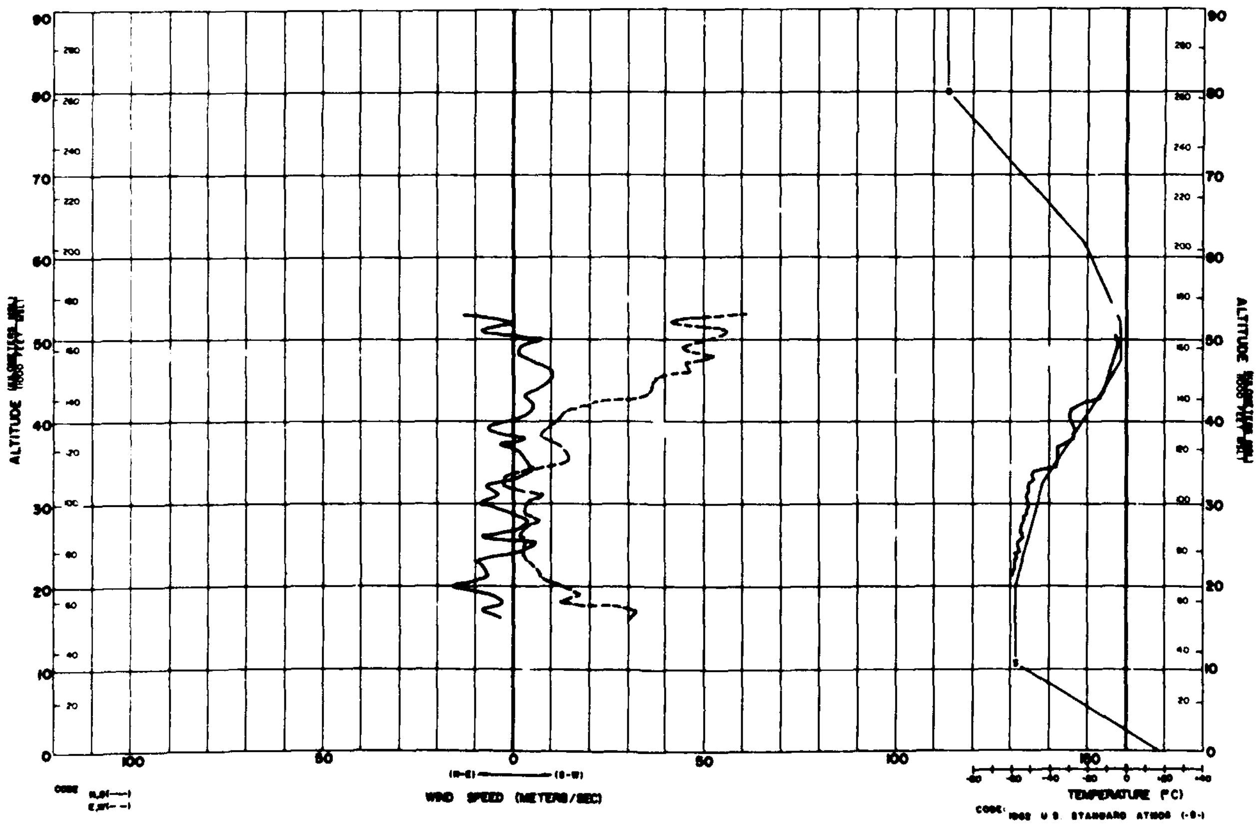
ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C
58.00	5.61	67.91	
57.00	9.15	67.26	
56.00	5.90	67.56	-14.1
55.00	15.92	62.49	-14.7
54.00	10.98	65.18	-14.8
53.00	6.67	61.06	-15.6
52.00	-.24	56.10	-14.0
51.00	5.62	60.51	-12.3
50.00	12.68	45.00	-11.7
49.00	2.19	40.80	-13.1
48.00	7.28	45.59	-14.9
47.00	13.29	46.41	-15.0
46.00	13.69	40.90	-15.5
45.00	10.29	35.41	-15.3
44.00	7.60	32.29	-14.6
43.00	4.38	26.21	-16.7
42.00	11.28	15.02	-20.5
41.00	7.21	12.97	-19.8
40.00	-.60	10.13	-20.8
39.00	-11.52	11.89	-20.6
38.00	-5.29	12.61	-23.1
37.00	3.98	8.66	-26.4
36.00	7.81	15.24	-22.8
35.00	9.26	13.64	-30.0
34.00	5.41	5.04	-36.0
33.00	3.09	.96	-38.2
32.00	-10.29	3.94	-38.4
31.00	-4.09	6.40	-39.6
30.00	-2.17	8.92	-43.0
29.00	-3.41	7.21	-44.1
28.00	1.28	9.38	-42.1
27.00	1.28	6.38	-43.6
26.00	-.79	7.02	-45.4
25.00	-6.46	4.47	-51.5
24.00	-5.18	1.79	-52.2
23.00	3.49	7.56	-55.2
22.00	-10.45	13.07	-57.7
21.00	-12.76	13.97	-64.8
20.00	-7.19	13.52	-64.3
19.00	-6.89	14.94	-69.3



METEOROLOGICAL ROCKET SOUNDING DATA

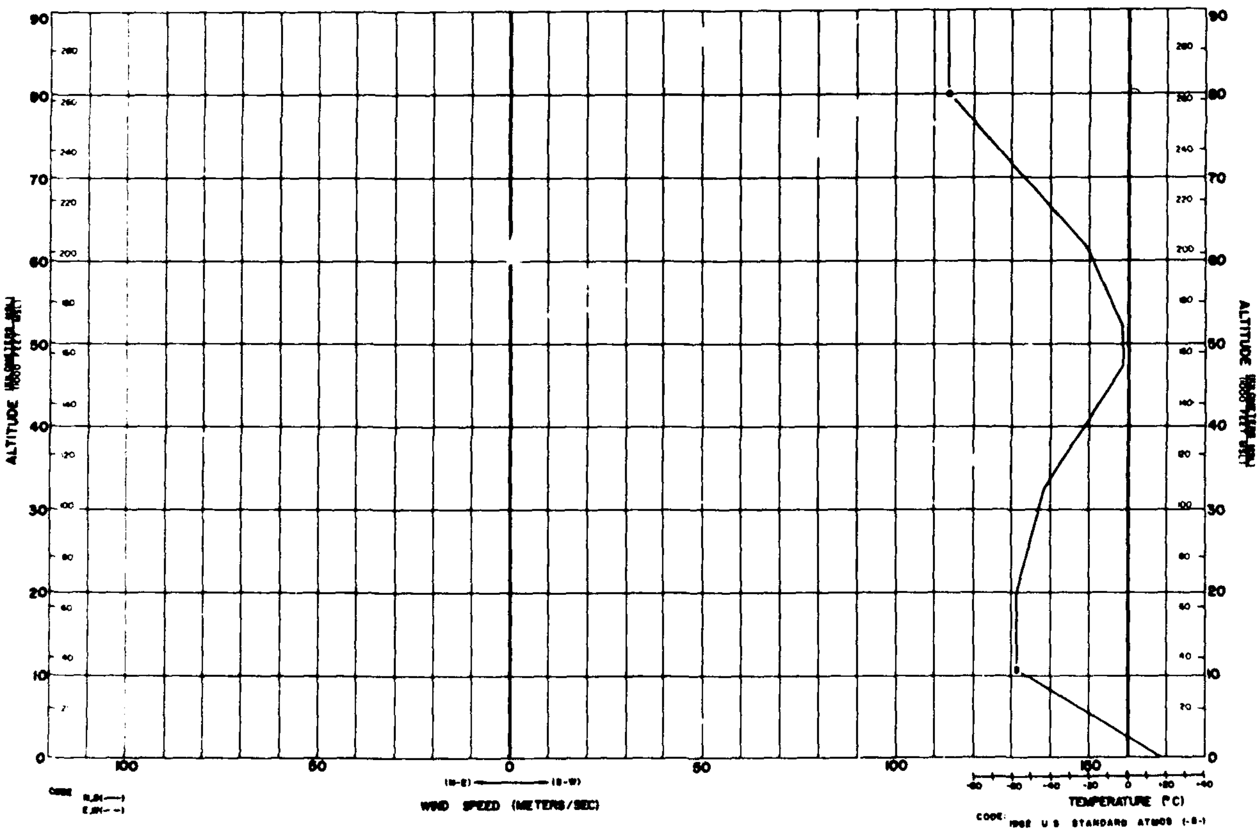
EGLIN AFB, FLORIDA ARCAS 8 7 MARCH 1970 2015 [illegible] STS-OZONESONDE

ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C	OZONE $CmO_3/Km \times 10^{-3}$
49.71	5.95	49.48	-4.1	.35
49.35	2.27	46.91	-4.0	.49
49.00	1.54	44.93	-4.0	.58
48.66	1.23	47.00		.70
44.73	9.48	37.31		1.48
44.21	8.12	36.75		1.60
43.70	6.78	36.10	-12.2	1.83
43.22	4.11	35.11	-14.0	2.09
42.75	4.00	32.66	-15.5	2.46
42.30	5.13	26.00	-19.0	2.78
41.85	5.36	18.24	-22.5	3.22
41.42	5.00	15.14	-26.5	3.77
41.00	4.78	14.00	-29.2	4.26
40.60	3.11	12.98	-29.4	4.84
40.20	1.00	12.11	-29.0	5.39
39.82	-2.00	11.10	-28.6	5.08
39.44	-4.12	10.09	-27.9	5.89
39.07	5.99	9.91	-27.3	5.94
38.70	6.14	8.84	-27.0	6.06
38.35	-1.00	8.00	-27.2	6.21
38.00	3.17	7.83	-27.7	6.35
37.67	1.31	8.12	-29.1	6.44
37.36	-1.85	10.53	-31.2	6.61
37.05	-3.00	10.98	-34.4	6.50
36.74	-3.00	13.00	-35.0	6.55
36.44	-.47	14.00	-35.0	6.44
36.15	1.13	14.44	-34.8	6.15
35.88	2.00	14.72	-34.9	6.15
35.42	2.72	14.85	-35.7	6.26
35.00	3.00	14.91	-36.3	6.52
34.58	3.92	13.00	-36.6	6.87
34.18	4.98	6.12	-40.7	7.68
33.80	4.77	3.98	-44.5	6.84
33.44	2.97	.72	-48.8	6.61
33.08	2.00	-1.97	-49.1	8.82
32.74	-1.11	-2.47	-50.0	5.94
32.06	-7.10	-2.45	-50.3	5.51
31.55	-6.00	1.54	-50.1	10.90
30.99	-3.98	7.41	-50.6	9.63
30.41	-7.00	4.43	-51.0	19.72



ARCAS 8 7 MARCH 197-
(CONTINUED)

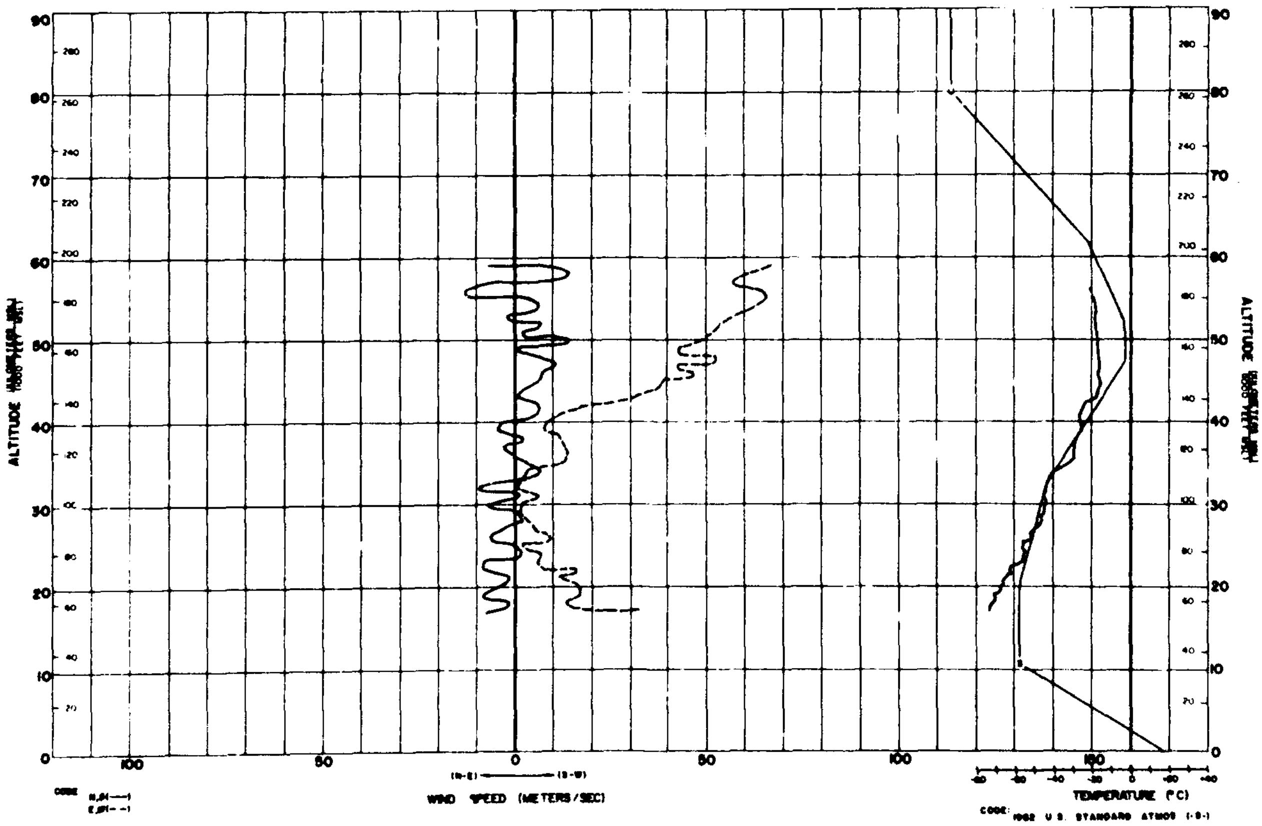
ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C	OZONE $CmO_3/Km \times 10^{-3}$
29.64	-7.11	3.91	[illegible]	12.99
28.95	-.93	4.12	-51.5	19.05
28.37	3.00	6.55	-52.6	15.34
27.83	4.14	6.74	-52.8	19.00
27.16	1.13	4.17	-53.8	16.21
26.93	-.12	3.05	-54.0	19.78
26.77	-.84	2.98	-54.0	14.44
26.42	-4.18	1.98	-55.5	21.69
26.00	-7.82	1.80	-55.3	20.59
25.62	-6.28	1.99	-55.1	21.95
25.48	-2.00	2.16	-55.3	20.91
25.25	.50	2.46	-56.2	21.37
24.90	5.79	3.00	-57.0	18.44
24.33	2.84	3.92	-56.7	22.21
24.11	1.31	4.18	-56.5	20.27
24.01	1.00	4.23	-56.3	21.05
23.50	-3.96	5.09	-57.1	19.26
23.09	-9.00	5.99	-57.4	14.18
22.95	-9.61	6.18	-57.7	13.46
22.41	-8.15	7.10	-58.0	12.99
22.03	-7.50	7.63	-58.0	16.38
21.54	-7.91	9.11	-58.8	16.65
21.30	-6.52	11.56	-58.8	15.30
21.14	-6.23	11.98	-58.9	17.37
20.97	-6.32	14.00	-58.9	16.12
20.29	-11.71	14.56		17.78
19.66	-12.97	16.72		21.20
19.29	-8.00	13.91		28.30
19.14	-7.14	13.00		25.61
18.97	-6.00	12.80		27.96
18.44	-3.64	24.11		17.20
18.13	-2.91	29.85		22.59
17.72	-4.00	32.00		25.08
17.41	-6.45	31.05		17.63
16.63	-6.00			10.13
16.36	-4.51			15.98



METEOROLOGICAL ROCKET SOUNDING DATA

EGLIN AFB, FLORIDA   ARCAS 9   7 MARCH 1970   2020 [illegible]   ARCASONDE

ALTITUDE KM	-N + S VELOCITY M/SEC	-E + W VELOCITY M/SEC	TEMPERATURE °C
59.00	-7.37	67.06	
58.00	14.45	60.24	
57.00	-4.03	57.08	
56.00	-13.60	62.20	
55.00	1.50	65.50	-19.1
54.00	5.61	63.17	-18.0
53.00	-1.47	50.66	-17.1
52.00	6.32	54.00	-17.3
51.00	2.31	51.04	-17.1
50.00	14.35	48.25	-16.7
49.00	.43	43.58	-16.3
48.00	5.43	51.68	-16.0
47.00	10.07	43.78	-15.9
46.00	7.88	46.03	-15.9
45.00	6.60	39.96	-16.0
44.00	3.40	37.29	-16.0
43.00	.04	30.87	-18.0
42.00	5.86	17.49	-24.5
41.00	5.34	12.77	-25.5
40.00	-2.32	8.53	-26.0
39.00	-4.69	7.50	-23.2
38.00	1.27	11.34	-27.0
37.00	-2.27	12.33	-28.9
36.00	-.18	14.19	-29.0
35.00	2.84	13.07	-31.0
34.00	6.61	3.38	-38.0
33.00	.52	.97	-41.8
32.00	-9.67	.01	-43.1
31.00	.61	6.07	-44.1
30.00	-6.23	2.56	-43.1
29.00	.31	.73	-44.6
28.00	1.23	4.53	-46.2
27.00	-3.36	5.09	-49.0
26.00	-5.79	9.23	-50.6
25.00	-.24	2.16	-55.0
24.00	.94	7.05	-55.0
23.00	-8.04	6.85	-55.9
22.00	-7.55	15.83	-61.8
21.00	-1.47	11.79	-64.8
20.00	-12.97	15.84	-66.0
19.00	-8.97	16.17	-70.5
18.00	-1.93	14.13	-70.5
17.00	-6.03	31.88	-72.9



ATMOSPHERIC SCIENCES RESEARCH PAPERS

1. Webb, W.L., "Development of Droplet Size Distributions in the Atmosphere," June 1954.
2. Hansen, F. V., and H. Rachele, "Wind Structure Analysis and Forecasting Methods for Rockets," June 1954.
3. Webb, W. L., "Net Electrification of Water Droplets at the Earth's Surface," *J. Meteorol.*, December 1954.
4. Mitchell, R., "The Determination of Non-Ballistic Projectile Trajectories," March 1955.
5. Webb, W. L., and A. McPike, "Sound Ranging Technique for Determining the Trajectory of Supersonic Missiles," #1, March 1955.
6. Mitchell, R., and W. L. Webb, "Electromagnetic Radiation through the Atmosphere," #1, April 1955.
7. Webb, W. L., A. McPike, and H. Thompson, "Sound Ranging Technique for Determining the Trajectory of Supersonic Missiles," #2, July 1955.
8. Barichivich, A., "Meteorological Effects on the Refractive Index and Curvature of Microwaves in the Atmosphere," August 1955.
9. Webb, W. L., A. McPike and H. Thompson, "Sound Ranging Technique for Determining the Trajectory of Supersonic Missiles," #3, September 1955.
10. Mitchell, R., "Notes on the Theory of Longitudinal Wave Motion in the Atmosphere," February 1956.
11. Webb, W. L., "Particulate Counts in Natural Clouds," *J. Meteorol.*, April 1956.
12. Webb, W. L., "Wind Effect on the Aerobee," #1, May 1956.
13. Rachele, H., and L. Anderson, "Wind Effect on the Aerobee," #2, August 1956.
14. Beyers, N., "Electromagnetic Radiation through the Atmosphere," #2, January 1957.
15. Hansen, F. V., "Wind Effect on the Aerobee," #3, January 1957.
16. Kershner, J., and H. Bear, "Wind Effect on the Aerobee," #4, January 1957.
17. Hoidale, G., "Electromagnetic Radiation through the Atmosphere," #3, February 1957.
18. Querfeld, C. W., "The Index of Refraction of the Atmosphere for 2.2 Micron Radiation," March 1957.
19. White, Lloyd, "Wind Effect on the Aerobee," #5, March 1957.
20. Kershner, J. G., "Development of a Method for Forecasting Component Ballistic Wind," August 1957.
21. Layton, Ivan, "Atmospheric Particle Size Distribution," December 1957.
22. Rachele, Henry and W. H. Hatch, "Wind Effect on the Aerobee," #6, February 1958.
23. Beyers, N. J., "Electromagnetic Radiation through the Atmosphere," #4, March 1958.
24. Prosser, Shirley J., "Electromagnetic Radiation through the Atmosphere," #5, April 1958.
25. Armendariz, M., and P. H. Taft, "Double Theodolite Ballistic Wind Computations," June 1958.
26. Jenkins, K. R. and W. L. Webb, "Rocket Wind Measurements," June 1958.
27. Jenkins, K. R., "Measurement of High Altitude Winds with Loki," July 1958.
28. Hoidale, G., "Electromagnetic Propagation through the Atmosphere," #6, February 1959.
29. McLardie, M., R. Helvey, and L. Traylor, "Low-Level Wind Profile Prediction Techniques," #1, June 1959.
30. Lamberth, Roy, "Gustiness at White Sands Missile Range," #1, May 1959.
31. Beyers, N. J., B. Hinds, and G. Hoidale, "Electromagnetic Propagation through the Atmosphere," #7, June 1959.
32. Beyers, N. J., "Radar Refraction at Low Elevation Angles (U)," Proceedings of the Army Science Conference, June 1959.
33. White, L., O. W. Thiele and P. H. Taft, "Summary of Ballistic and Meteorological Support During IGY Operations at Fort Churchill, Canada," August 1959.
34. Hainline, D. A., "Drag Cord-Aerovane Equation Analysis for Computer Application," August 1959.
35. Hoidale, G. B., "Slope-Valley Wind at WSMR," October 1959.
36. Webb, W. L., and K. R. Jenkins, "High Altitude Wind Measurements," *J. Meteorol.*, 16, 5, October 1959.

37. White, Lloyd, "Wind Effect on the Aerobee," #9, October 1959.
38. Webb, W. L., J. W. Coffman, and G. Q. Clark, "A High Altitude Acoustic Sensing System," December 1959.
39. Webb, W. L., and K. R. Jenkins, "Application of Meteorological Rocket Systems," J. Geophys. Res., 64, 11, November 1959.
40. Duncan, Louis, "Wind Effect on the Aerobee," #10, February 1960.
41. Helvey, R. A., "Low-Level Wind Profile Prediction Techniques," #2, February 1960.
42. Webb, W. L., and K. R. Jenkins, "Rocket Sounding of High-Altitude Parameters," *Proc. GM Rel. Symp.*, Dept. of Defense, February 1960.
43. Armendariz, M., and H. H. Monahan, "A Comparison Between the Double Theodolite and Single-Theodolite Wind Measuring Systems," April 1960.
44. Jenkins, K. R., and P. H. Taft, "Weather Elements in the Tularosa Basin," July 1960.
45. Beyers, N. J., "Preliminary Radar Performance Data on Passive Rocket-Borne Wind Sensors," IRE TRANS, MIL ELECT, MIL-4, 2-3, April-July 1960.
46. Webb, W. L., and K. R. Jenkins, "Speed of Sound in the Stratosphere," June 1960.
47. Webb, W. L., K. R. Jenkins, and G. Q. Clark, "Rocket Sounding of High Atmosphere Meteorological Parameters," *IRE Trans. Mil. Elect.*, MIL-4, 2-3, April-July 1960.
48. Helvey, R. A., "Low-Level Wind Profile Prediction Techniques," #3, September 1960.
49. Beyers, N. J., and O. W. Thiele, "Meteorological Wind Sensors," August 1960.
50. Armijo, Larry, "Determination of Trajectories Using Range Data from Three Noncolinear Radar Stations," September 1960.
51. Carnes, Patsy Sue, "Temperature Variations in the First 200 Feet of the Atmosphere in an Arid Region," July 1961.
52. Springer, H. S., and R. O. Olsen, "Launch Noise Distribution of Nike-Zeus Missiles," July 1961.
53. Thiele, O. W., "Density and Pressure Profiles Derived from Meteorological Rocket Measurements," September 1961.
54. Diamond, M. and A. B. Gray, "Accuracy of Missile Sound Ranging," November 1961.
55. Lamberth, R. L. and D. R. Veith, "Variability of Surface Wind in Short Distances," #1, October 1961.
56. Swanson, R. N., "Low-Level Wind Measurements for Ballistic Missile Application," January 1962.
57. Lamberth, R. L. and J. H. Grace, "Gustiness at White Sands Missile Range," #2, January 1962.
58. Swanson, R. N. and M. M. Hoidale, "Low-Level Wind Profile Prediction Techniques," #4, January 1962.
59. Rachele, Henry, "Surface Wind Model for Unguided Rockets Using Spectrum and Cross Spectrum Techniques," January 1962.
60. Rachele, Henry, "Sound Propagation through a Windy Atmosphere," #2, February 1962.
61. Webb, W. L., and K. R. Jenkins, "Sonic Structure of the Mesosphere," *J. Acous. Soc. Amer.*, 34, 2, February 1962.
62. Tourin, M. H. and M. M. Hoidale, "Low-Level Turbulence Characteristics at White Sands Missile Range," April 1962.
63. Miers, Bruce T., "Mesospheric Wind Reversal over White Sands Missile Range," March 1962.
64. Fisher, E., R. Lee and H. Rachele, "Meteorological Effects on an Acoustic Wave within a Sound Ranging Array," May 1962.
65. Walter, E. L., "Six Variable Ballistic Model for a Rocket," June 1962.
66. Webb, W. L., "Detailed Acoustic Structure Above the Tropopause," *J. Applied Meteorol.*, 1, 2, June 1962.
67. Jenkins, K. R., "Empirical Comparisons of Meteorological Rocket Wind Sensors," *J. Appl. Meteor.*, June 1962.
68. Lamberth, Roy, "Wind Variability Estimates as a Function of Sampling Interval," July 1962.
69. Rachele, Henry, "Surface Wind Sampling Periods for Unguided Rocket Impact Prediction," July 1962.
70. Traylor, Larry, "Coriolis Effects on the Aerobee-Hi Sounding Rocket," August 1962.
71. McCoy, J., and G. Q. Clark, "Meteorological Rocket Thermometry," August 1962.
72. Rachele, Henry, "Real-Time Prelaunch Impact Prediction System," August 1962.

73. Beyers, N. J., O. W. Thiele, and N. K. Wagner, "Performance Characteristics of Meteorlogical Rocket Wind and Temperature Sensors," October 1962.
74. Coffman, J., and R. Price, "Some Errors Associated with Acoustical Wind Measurements through a Layer," October 1962.
75. Armendariz, M., E. Fisher, and J. Serna, "Wind Shear in the Jet Stream at WSMR," November 1962.
76. Armendariz, M., F. Hansen, and S. Carnes, "Wind Variability and its Effect on Rocket Impact Prediction," January 1963.
77. Querfeld, C., and Wayne Yunker, "Pure Rotational Spectrum of Water Vapor, I: Table of Line Parameters," February 1963.
78. Webb, W. L., "Acoustic Component of Turbulence," *J. Applied Meteorol.*, 2, 2, April 1963.
79. Beyers, N. and L. Engberg, "Seasonal Variability in the Upper Atmosphere," May 1963.
80. Williamson, L. E., "Atmospheric Acoustic Structure of the Sub-polar Fall," May 1963.
81. Lamberth, Roy and D. Veith, "Upper Wind Correlations in Southwestern United States," June 1963.
82. Sandlin, E., "An analysis of Wind Shear Differences as Measured by AN/FPS-16 Radar and AN/GMD-1B Rawinsonde," August 1963.
83. Diamond, M. and R. P. Lee, "Statistical Data on Atmospheric Design Properties Above 30 km," August 1963.
84. Thiele, O. W., "Mesospheric Density Variability Based on Recent Meteorological Rocket Measurements," *J. Applied Meteorol.*, 2, 5, October 1963.
85. Diamond, M., and O. Essenwanger, "Statistical Data on Atmospheric Design Properties to 30 km," *Astro. Aero. Engr.*, December 1963.
86. Hansen, F. V., "Turbulence Characteristics of the First 62 Meters of the Atmosphere," December 1963.
87. Morris, J. E., and B. T. Miers, "Circulation Disturbances Between 25 and 70 kilometers Associated with the Sudden Warming of 1963," *J. of Geophys. Res.*, January 1964.
88. Thiele, O. W., "Some Observed Short Term and Diurnal Variations of Stratospheric Density Above 30 km," January 1964.
89. Sandlin, R. E., Jr. and E. Armijo, "An Analysis of AN/FPS-16 Radar and AN/GMD-1B Rawinsonde Data Differences," January 1964.
90. Miers, B. T., and N. J. Beyers, "Rocketsonde Wind and Temperature Measurements Between 30 and 70 km for Selected Stations," *J. Applied Meteorol.*, February 1964.
91. Webb, W. L., "The Dynamic Stratosphere," *Astronautics and Aerospace Engineering*, March 1964.
92. Low, R. D. H., "Acoustic Measurements of Wind through a Layer," March 1964.
93. Diamond. M., "Cross Wind Effect on Sound Propagation," *J. Applied Meteorol.*, April 1964.
94. Lee, R. P., "Acoustic Ray Tracing," April 1964.
95. Reynolds, R. D., "Investigation of the Effect of Lapse Rate on Balloon Ascent Rate," May 1964.
96. Webb, W. L., "Scale of Stratospheric Detail Structure," *Space Research V*, May 1964.
97. Barber, T. L., "Proposed X-Ray-Infrared Method for Identification of Atmospheric Mineral Dust," June 1964.
98. Thiele, O. W., "Ballistic Procedures for Unguided Rocket Studies of Nuclear Environments (U)," Proceedings of the Army Science Conference, June 1964.
99. Horn, J. D., and E. J. Trawle, "Orographic Effects on Wind Variability," July 1964.
100. Hoidale, G., C. Querfeld, T. Hall, and R. Mireles, "Spectral Transmissivity of the Earth's Atmosphere in the 250 to 500 Wave Number Interval," #1, September 1964.
101. Duncan, L. D., R. Ensey, and B. Engebos, "Athena Launch Angle Determination," September 1964.
102. Thiele, O. W., "Feasibility Experiment for Measuring Atmospheric Density Through the Altitude Range of 60 to 100 KM Over White Sands Missile Range," October 1964.
103. Duncan, L. D., and R. Ensey, "Six-Degree-of-Freedom Digital Simulation Model for Unguided, Fin-Stabilized Rockets," November 1964.

104. Hoidale, G., C. Querfeld, T. Hall, and R. Mireles, "Spectral Transmissivity of the Earth's Atmosphere in the 250 to 500 Wave Number Interval," #2, November 1964.

105. Webb, W. L., "Stratospheric Solar Response," *J. Atmos. Sci.*, November 1964.

106. McCoy, J. and G. Clark, "Rocketsonde Measurement of Stratospheric Temperature," December 1964.

107. Farone, W. A., "Electromagnetic Scattering from Radially Inhomogeneous Spheres as Applied to the Problem of Clear Atmosphere Radar Echoes," December 1964.

108. Farone, W. A., "The Effect of the Solid Angle of Illumination or Observation on the Color Spectra of 'White Light' Scattered by Cylinders," January 1965.

109. Williamson, L. E., "Seasonal and Regional Characteristics of Acoustic Atmospheres," *J. Geophys. Res.*, January 1965.

110. Armendariz, M., "Ballistic Wind Variability at Green River, Utah," January 1965.

111. Low, R. D. H., "Sound Speed Variability Due to Atmospheric Composition," January 1965.

112. Querfeld, C. W., 'Mie Atmospheric Optics," *J. Opt. Soc. Amer.*, January 1965.

113. Coffman, J., "A Measurement of the Effect of Atmospheric Turbulence on the Coherent Properties of a Sound Wave," January 1965.

114. Rachele, H., and D. Veith, "Surface Wind Sampling for Unguided Rocket Impact Prediction," January 1965.

115. Ballard, H., and M. Izquierdo, "Reduction of Microphone Wind Noise by the Generation of a Proper Turbulent Flow," February 1965.

116. Mireles, R., "An Algorithm for Computing Half Widths of Overlapping Lines on Experimental Spectra," February 1965.

117. Richart, H., "Inaccuracies of the Single-Theodolite Wind Measuring System in Ballistic Application," February 1965.

118. D'Arcy, M., "Theoretical and Practical Study of Aerobee-150 Ballistics," March 1965.

119. McCoy, J., "Improved Method for the Reduction of Rocketsonde Temperature Data," March 1965.

120. Mireles, R., "Uniqueness Theorem in Inverse Electromagnetic Cylindrical Scattering," April 1965.

121. Coffman, J., "The Focusing of Sound Propagating Vertically in a Horizontally Stratified Medium," April 1965.

122. Farone, W. A., and C. Querfeld, "Electromagnetic Scattering from an Infinite Circular Cylinder at Oblique Incidence," April 1965.

123. Rachele, H., "Sound Propagation through a Windy Atmosphere," April 1965.

124. Miers, B., "Upper Stratospheric Circulation over Ascension Island," April 1965.

125. Rider, L., and M. Armendariz, " A Comparison of Pibal and Tower Wind Measurements," April 1965.

126. Hoidale, G. B., "Meteorological Conditions Allowing a Rare Observation of 24 Micron Solar Radiation Near Sea Level," *Meteorol. Magazine*, May 1965.

127. Beyers, N. J., and B. T. Miers, "Diurnal Temperature Change in the Atmosphere Between 30 and 60 km over White Sands Missile Range," *J. Atmos. Sci.*, May 1965.

128. Querfeld, C., and W. A. Farone, "Tables of the Mie Forward Lobe," May 1965.

129. Farone, W. A., Generalization of Rayleigh-Gans Scattering from Radially Inhomogeneous Spheres," *J. Opt. Soc. Amer.*, June 1965.

130. Diamond, M., "Note on Mesospheric Winds Above White Sands Missile Range," *J. Applied Meteorol.*, June 1965.

131. Clark, G. Q., and J. G. McCoy, "Measurement of Stratospheric Temperature," *J. Applied Meteorol.*, June 1965.

132. Hall, T., G. Hoidale, R. Mireles, and C. Querfeld, "Spectral Transmissivity of the Earth's Atmosphere in the 250 to 500 Wave Number Interval," #3, July 1965.

133. McCoy, J., and C. Tate, "The Delta-T Meteorological Rocket Payload," June 1964.

134. Horn, J. D., "Obstacle Influence in a Wind Tunnel," July 1965.

135. McCoy, J., "An AC Probe for the Measurement of Electron Density and Collision Frequency in the Lower Ionosphere," July 1965.

136. Miers, B. T., M. D. Kays, O. W. Thiele and E. M. Newby, "Investigation of Short Term Variations of Several Atmospheric Parameters Above 30 KM," July 1965.

137. Serna, J., "An Acoustic Ray Tracing Method for Digital Computation," September 1965.
138. Webb, W. L., "Morphology of Noctilucent Clouds," *J. Geophys. Res.*, 70, 18, 4463-4475, September 1965.
139. Kays, M., and R. A. Craig, "On the Order of Magnitude of Large-Scale Vertical Motions in the Upper Stratosphere," *J. Geophys. Res.*, 70, 18, 4453-4462, September 1965.
140. Rider, L., "Low-Level Jet at White Sands Missile Range," September 1965.
141. Lamberth, R. L., R. Reynolds, and Morton Wurtele, "The Mountain Lee Wave at White Sands Missile Range," *Bull. Amer. Meteorol. Soc.*, 46, 10, October 1965.
142. Reynolds, R. and R. L. Lamberth, "Ambient Temperature Measurements from Radiosondes Flown on Constant-Level Balloons," October 1965.
143. McCluney, E., "Theoretical Trajectory Performance of the Five-Inch Gun Probe System," October 1965.
144. Pena, R. and M. Diamond, "Atmospheric Sound Propagation near the Earth's Surface," October 1965.
145. Mason, J. B., "A Study of the Feasibility of Using Radar Chaff For Stratospheric Temperature Measurements," November 1965.
146. Diamond, M., and R. P. Lee, "Long-Range Atmospheric Sound Propagation," *J. Geophys. Res.*, 70, 22, November 1965.
147. Lamberth, R. L., "On the Measurement of Dust Devil Parameters," November 1965.
148. Hansen, F. V., and P. S. Hansen, "Formation of an Internal Boundary over Heterogeneous Terrain," November 1965.
149. Webb, W. L., "Mechanics of Stratospheric Seasonal Reversals," November 1965.
150. U. S. Army Electronics R & D Activity, "U. S. Army Participation in the Meteorological Rocket Network," January 1966.
151. Rider, L. J., and M. Armendariz, "Low-Level Jet Winds at Green River, Utah," February 1966.
152. Webb, W. L., "Diurnal Variations in the Stratospheric Circulation," February 1966.
153. Beyers, N. J., B. T. Miers, and R. J. Reed, "Diurnal Tidal Motions near the Stratopause During 48 Hours at WSMR," February 1966.
154. Webb, W. L., "The Stratospheric Tidal Jet," February 1966.
155. Hall, J. T., "Focal Properties of a Plane Grating in a Convergent Beam," February 1966.
156. Duncan, L. D., and Henry Rachele, "Real-Time Meteorological System for Firing of Unguided Rockets," February 1966.
157. Kays, M. D., "A Note on the Comparison of Rocket and Estimated Geostrophic Winds at the 10-mb Level," *J. Appl. Meteor.*, February 1966.
158. Rider, L., and M. Armendariz, " A Comparison of Pibal and Tower Wind Measurements," *J. Appl. Meteor.*, 5, February 1966
159. Duncan, L. D., "Coordinate Transformations in Trajectory Simulations," February 1966.
160. Williamson, L. E., "Gun-Launched Vertical Probes at White Sands Missile Range," February 1966.
161. Randhawa, J. S., Ozone Measurements with Rocket-Borne Ozonesondes," March 1966.
162. Armendariz, Manuel, and Laurence J. Rider, "Wind Shear for Small Thickness Layers," March 1966.
163. Low, R. D. H., "Continuous Determination of the Average Sound Velocity over an Arbitrary Path," March 1966.
164. Hansen, Frank V., "Richardson Number Tables for the Surface Boundary Layer," March 1966.
165. Cochran, V. C., E. M. D'Arcy, and Florencio Ramirez, "Digital Computer Program for Five-Degree-of-Freedom Trajectory," March 1966.
166. Thiele, O. W., and N. J. Beyers, "Comparison of Rocketsonde and Radiosonde Temperatures and a Verification of Computed Rocketsonde Pressure and Density," April 1966.
167. Thiele, O. W., "Observed Diurnal Oscillations of Pressure and Density in the Upper Stratosphere and Lower Mesosphere," April 1966.
168. Kays, M. D., and R. A. Craig, "On the Order of Magnitude of Large-Scale Vertical Motions in the Upper Stratosphere," *J. Geophy. Res.*, April 1966.
169. Hansen, F. V., "The Richardson Number in the Planetary Boundary Layer," May 1966.

170. Ballard, H. N., "The Measurement of Temperature in the Stratosphere and Mesosphere," June 1966.
171. Hansen, Frank V., "The Ratio of the Exchange Coefficients for Heat and Momentum in a Homogeneous, Thermally Stratified Atmosphere," June 1966.
172. Hansen, Frank V., "Comparison of Nine Profile Models for the Diabatic Boundary Layer," June 1966.
173. Rachele, Henry, "A Sound-Ranging Technique for Locating Supersonic Missiles," May 1966.
174. Farone, W. A., and C. W. Querfeld, "Electromagnetic Scattering from Inhomogeneous Infinite Cylinders at Oblique Incidence," *J. Opt. Soc. Amer.* 56, 4, 476-480, April 1966.
175. Mireles, Ramon, "Determination of Parameters in Absorption Spectra by Numerical Minimization Techniques," *J. Opt. Soc. Amer.* 56, 5, 644-647, May 1966.
176. Reynolds, R., and R. L. Lamberth, "Ambient Temperature Measurements from Radiosondes Flown on Constant-Level Balloons," *J. Appl. Meteorol.*, 5, 3, 304-307, June 1966.
177. Hall, James T., "Focal Properties of a Plane Grating in a Convergent Beam," *Appl. Opt.*, 5, 1051, June 1966
178. Rider, Laurence J., "Low-Level Jet at White Sands Missile Range," *J. Appl. Meteorol.*, 5, 3, 283-287, June 1966.
179. McCluney, Eugene, "Projectile Dispersion as Caused by Barrel Displacement in the 5-Inch Gun Probe System," July 1966.
180. Armendariz, Manuel, and Laurence J. Rider, "Wind Shear Calculations for Small Shear Layers," June 1966.
181. Lamberth, Roy L., and Manuel Armendariz, "Upper Wind Correlations in the Central Rocky Mountains," June 1966.
182. Hansen, Frank V., and Virgil D. Lang, "The Wind Regime in the First 62 Meters of the Atmosphere," June 1966.
183. Randhawa, Jagir S., "Rocket-Borne Ozonesonde," July 1966.
184. Rachele, Henry, and L. D. Duncan, "The Desirability of Using a Fast Sampling Rate for Computing Wind Velocity from Pilot-Balloon Data," July 1966.
185. Hinds, B. D., and R. G. Pappas, "A Comparison of Three Methods for the Correction of Radar Elevation Angle Refraction Errors," August 1966.
186. Riedmuller, G. F., and T. L. Barber, "A Mineral Transition in Atmospheric Dust Transport," August 1966.
187. Hall, J. T., C. W. Querfeld, and G. B. Hoidale, "Spectral Transmissivity of the Earth's Atmosphere in the 250 to 500 Wave Number Interval," Part IV (Final), July 1966.
188. Duncan, L. D. and B. F. Engebos, "Techniques for Computing Launcher Settings for Unguided Rockets," September 1966.
189. Duncan, L. D., "Basic Considerations in the Development of an Unguided Rocket Trajectory Simulation Model," September 1966.
190. Miller, Walter B., "Consideration of Some Problems in Curve Fitting," September 1966.
191. Cermak, J. E., and J. D. Horn, "The Tower Shadow Effect," August 1966.
192. Webb, W. L., "Stratospheric Circulation Response to a Solar Eclipse," October 1966.
193. Kennedy, Bruce, "Muzzle Velocity Measurement," October 1966.
194. Traylor, Larry E., "A Refinement Technique for Unguided Rocket Drag Coefficients," October 1966
195. Nusbaum, Henry, "A Reagent for the Simultaneous Microscope Determination of Quartz and Halides," October 1966.
196. Kays, Marvin and R. O. Olsen, "Improved Rocketsonde Parachute-derived Wind Profiles," October 1966.
197. Engebos, Bernard F. and Duncan, Louis D., "A Nomogram for Field Determination of Launcher Angles for Unguided Rockets," October 1966.
198. Webb, W. L., "Midlatitude Clouds in the Upper Atmosphere," November 1966.
199. Hansen, Frank V., "The Lateral Intensity of Turbulence as a Function of Stability," November 1966.
200. Rider, L. J. and M. Armendariz, "Differences of Tower and Pibal Wind Profiles," November 1966.
201. Lee, Robert P., "A Comparison of Eight Mathematical Models for Atmospheric Acoustical Ray Tracing," November 1966.
202. Low, R. D. H., et al., "Acoustical and Meteorological Data Report SOTRAN I and II," November 1966.

203. Hunt, J. A. and J. D. Horn, "Drag Plate Balance," December 1966.
204. Armendariz, M., and H. Rachele, "Determination of a Representative Wind Profile from Balloon Data," December 1966.
205. Hansen, Frank V., "The Aerodynamic Roughness of the Complex Terrain of White Sands Missile Range," January 1967.
206. Morris, James E., "Wind Measurements in the Subpolar Mesopause Region," January 1967.
207. Hall, James T., "Attenuation of Millimeter Wavelength Radiation by Gaseous Water," January 1967.
208. Thiele, O. W., and N. J. Beyers, "Upper Atmosphere Pressure Measurements With Thermal Conductivity Gauges," January 1967.
209. Armendariz, M., and H. Rachele, "Determination of a Representative Wind Profile from Balloon Data," January 1967.
210. Hansen, F. V., "The Aerodynamic Roughness of the Complex Terrain of White Sands Missile Range, New Mexico," January 1967.
211. D'Arcy, Edward M., "Some Applications of Wind to Unguided Rocket Impact Prediction," March 1967.
212. Kennedy, Bruce, "Operation Manual for Stratosphere Temperature Sonde," March 1967.
213. Hoidale, G. B., S. M. Smith, A. J. Blanco, and T. L. Barber, "A Study of Atmospheric Dust," March 1967.
214. Longyear, J. Q., "An Algorithm for Obtaining Solutions to Laplace's Titad Equations," March 1967.
215. Rider, L. J., "A Comparison of Pibal with Raob and Rawin Wind Measurements," April 1967.
216. Breeland, A. H., and R. S. Bonner, "Results of Tests Involving Hemispherical Wind Screens in the Reduction of Wind Noise," April 1967.
217. Webb, Willis L., and Max C. Bolen, "The D-region Fair-Weather Electric Field," April 1967.
218. Kubinski, Stanley F., "A Comparative Evaluation of the Automatic Tracking Pilot-Balloon Wind Measuring System," April 1967.
219. Miller, Walter B., and Henry Rachele, "On Nonparametric Testing of the Nature of Certain Time Series," April 1967.
220. Hansen, Frank V., "Spacial and Temporal Distribution of the Gradient Richardson Number in the Surface and Planetary Layers," May 1967.
221. Randhawa, Jagir S., "Diurnal Variation of Ozone at High Altitudes," May 1967.
222. Ballard, Harold N., "A Review of Seven Papers Concerning the Measurement of Temperature in the Stratosphere and Mesosphere," May 1967.
223. Williams, Ben H., "Synoptic Analyses of the Upper Stratospheric Circulation During the Late Winter Storm Period of 1966," May 1967.
224. Horn, J. D., and J. A. Hunt, "System Design for the Atmospheric Sciences Office Wind Research Facility," May 1967.
225. Miller, Walter B., and Henry Rachele, "Dynamic Evaluation of Radar and Photo Tracking Systems, " May 1967.
226. Bonner, Robert S., and Ralph H. Rohwer, "Acoustical and Meteorological Data Report - SOTRAN III and IV," May 1967.
227. Rider, L. J., "On Time Variability of Wind at White Sands Missile Range, New Mexico," June 1967.
228. Randhawa, Jagir S., "Mesospheric Ozone Measurements During a Solar Eclipse," June 1967.
229. Beyers, N. J., and B. T. Miers, "A Tidal Experiment in the Equatorial Stratosphere over Ascension Island (8S)", June 1967.
230. Miller, W. B., and H. Rachele, "On the Behavior of Derivative Processes," June 1967
231. Walters, Randall K., "Numerical Integration Methods for Ballistic Rocket Trajectory Simulation Programs," June 1967.
232. Hansen, Frank V., "A Diabatic Surface Boundary Layer Model," July 1967.
233. Butler, Ralph L., and James K. Hall, "Comparison of Two Wind Measuring Systems with the Contraves Photo-Theodolite," July 1967.
234. Webb, Willis L., "The Source of Atmospheric Electrification," June 1967.

235. Hinds, B. D., "Radar Tracking Anomalies over an Arid Interior Basin," August 1967.
236. Christian, Larry O., "Radar Cross Sections for Totally Reflecting Spheres," August 1967.
237. D'Arcy, Edward M., "Theoretical Dispersion Analysis of the Aerobee 350," August 1967.
238. Anon., "Technical Data Package for Rocket-Borne Temperature Sensor," August 1967.
239. Glass, Roy I., Roy L. Lamberth, and Ralph D. Reynolds, "A High Resolution Continuous Pressure Sensor Modification for Radiosondes," August 1967.
240. Low, Richard D. H., "Acoustic Measurement of Supersaturation in a Warm Cloud," August 1967.
241. Rubio, Roberto, and Harold N. Ballard, "Time Response and Aerodynamic Heating of Atmospheric Temperature Sensing Elements," August 1967.
242. Seagraves, Mary Ann B., "Theoretical Performance Characteristics and Wind Effects for the Aerobee 150," August 1967.
243. Duncan, Louis Dean, "Channel Capacity and Coding," August 1967.
244. Dunaway, G. L., and Mary Ann B. Seagraves, "Launcher Settings Versus Jack Settings for Aerobee 150 Launchers - Launch Complex 35, White Sands Missile Range, New Mexico," August 1967.
245. Duncan, Louis D., and Bernard F. Engebos, "A Six-Degree-of-Freedom Digital Computer Program for Trajectory Simulation," October 1967.
246. Rider, Laurence J., and Manuel Armendariz, "A Comparison of Simultaneous Wind Profiles Derived from Smooth and Roughened Spheres," September 1967.
247. Reynolds, Ralph D., Roy L. Lamberth, and Morton G. Wurtele, "Mountain Wave Theory vs Field Test Measurements," September 1967.
248. Lee, Robert P., "Probabilistic Model for Acoustic Sound Ranging," October 1967.
249. Williamson, L. Edwin, and Bruce Kennedy, "Meteorological Shell for Standard Artillery Pieces - A Feasibility Study," October 1967.
250. Rohwer, Ralph H., "Acoustical, Meteorological and Seismic Data Report - SOTRAN V and VI," October 1967.
251. Nordquist, Walter S., Jr., "A Study in Acoustic Direction Finding," November 1967.
252. Nordquist, Walter S., Jr., "A Study of Acoustic Monitoring of the Gun Probe System," November 1967.
253. Avara, E. P., and B. T. Miers, "A Data Reduction Technique for Meteorological Wind Data above 30 Kilometers," December 1967.
254. Hansen, Frank V., "Predicting Diffusion of Atmospheric Contaminants by Consideration of Turbulent Characteristics of WSMR," January 1968.
255. Randhawa, Jagir S., "Rocket Measurements of Atmospheric Ozone," January 1968.
256. D'Arcy, Edward M., "Meteorological Requirements for the Aerobee-350," January 1968.
257. D'Arcy, Edward M., "A Computer Study of the Wind Frequency Response of Unguided Rockets," February 1968.
258. Williamson, L. Edwin, "Gun Launched Probes - Parachute Expulsion Tests Under Simulated Environment," February 1968.
259. Beyers, Norman J., Bruce T. Miers, and Elton P. Avara, "The Diurnal Tide Near the Stratopause over White Sands Missile Range, New Mexico," February 1968.
260. Traylor, Larry E., "Preliminary Study of the Wind Frequency Response of the Honest John M50 Tactical Rocket," March 1968.
261. Engebos, B. F., and L. D. Duncan, "Real-Time Computations of Pilot Balloon Winds," March 1968.
262. Butler, Ralph and L. D. Duncan, "Empirical Estimates of Errors in Double-Theodolite Wind Measurements," February 1968.
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11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
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13. ABSTRACT

An experiment to study the influence of a solar eclipse on the earth's lower atmosphere was conducted at Eglin Air Force Base, Florida, where a solar eclipse occurred on 7 March 1970. Three temperature-ozonesondes and eight Arcasondes were deployed into the upper stratosphere and lower mesosphere at times prior to, during, and after the total eclipse. In addition, two electrochemical ozonesondes were flown on balloons on 5 and 6 March. Resulting temperature, wind and ozone data are presented. No measurements were made during the totality. An increase in ozone was measured during and several hours after the partial eclipse. Higher temperatures and a perturbation in the zonal wind field were observed in the middle stratosphere during the partial eclipse.

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
1. Solar Eclipse 2. Ozone Concentration 3. Rocket-borne Ozonesonde 4. Dobson Spectrophotometer 5. STS-Ozonesonde 6. Arcas IA						

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